171

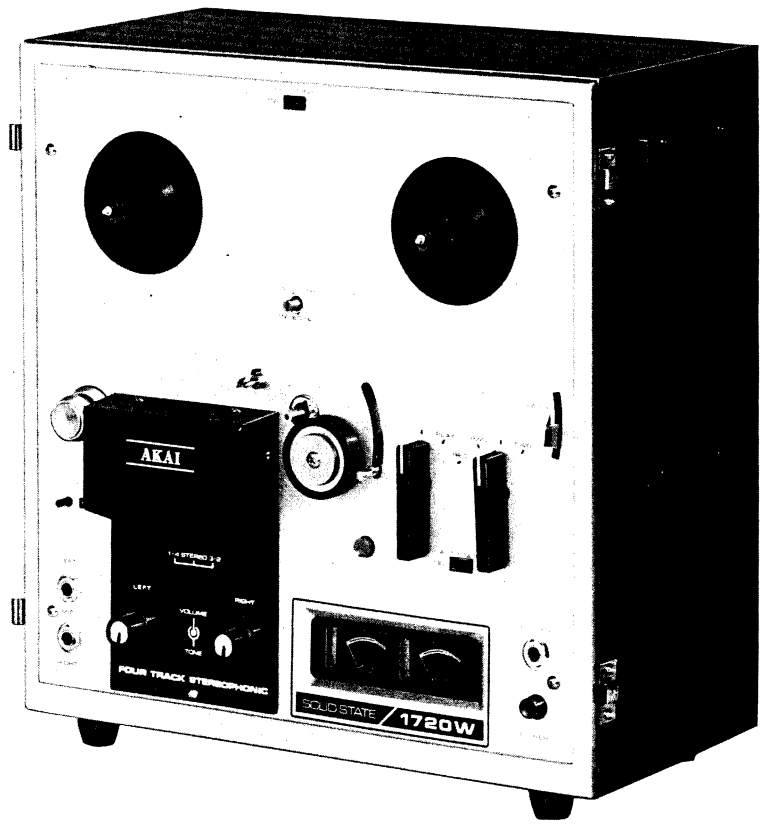
SERVICE MANUAL

AKAI TAPE RECORDER

MODEL 1720W

ALSO APPLICABLE TO MODEL 1720L

171



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When placing order for parts, please use Separate PARTS LIST or PRICE LIST FOR PARTS.

I. SPECIFICATIONS

WEIGHT	:	29.5 lbs. (13.4 kg)
DIMENSIONS	:	14.4" (H) x 14.2" (W) x 9.6" (D) (H360 x W355 x D240 mm)
POWER SUPPLY	:	100 to 240 V AC, 50/60 Hz
RECORDING SYSTEM	:	In-line 4-track stereo, monaural recording
PLAYBACK SYSTEM	:	In-line 4-track stereo, monaural play back
POWER CONSUMPTION	:	50 VA
TAPE SPEED	:	1-7/8, 3-3/4, 7-1/2 ips. (15 ips with 15" adaptor kit)
TAPE SPEED DEVIATION	:	Within ±3% at all speeds.
WOW AND FLUTTER	:	Less than 0.18% R.M.S. at 7-1/2" Less than 0.25% R.M.S. at 3-3/4" Less than 0.35% R.M.S. at 1-7/8"
FREQUENCY RESPONSE	:	40 to 15,000 Hz ± 4 dB at 7-1/2" 40 to 10,000 Hz ± 4 dB at 3-3/4" 40 to 4,000 Hz ± 4 dB at 1-7/8"
SIGNAL TO NOISE RATIO	:	More than 48 dB
DISTORTION (Total Harmonics)	:	Within 3% at 1,000 Hz 0 VU recording
CROSS-TALK	:	Less than −55 dB (monaural) Less than −43 dB (Stereo)
ERASE RATIO	:	Less than −65 dB
INSULATION RESISTANCE	:	More than 50 M ohms.
INSULATION DURABILITY	:	1,000 V AC for more than one minute duration
LINE OUTPUT	:	+4 dB ±2 dB (1.228 V), at 0 VU indication, 250 Hz 0 VU recorded tape. Required load impedance more than 50 K ohms.
POWER OUTPUT	:	More than 2 W Impedance ; 8 ohms
DIN OUTPUT	:	2.5 V at maximum volume Required load impedance more than 50 K ohms.
LINE INPUT	:	Above 30 mV Impedance ; 140 K ohms
MIC. INPUT	:	Above 3.5 mV Impedance ; 30 K ohms
DIN INPUT	:	Above 10 mV Impedance ; 43 K ohms
FAST FORWARD AND REWIND TIME	:	150 seconds for 1,200 ft. tape at 50 Hz 120 seconds for 1,200 ft. tape at 60 Hz
MONITOR SYSTEM	:	Program can be monitored during recording by using stereo headphones.
MOTOR	:	Two-speed induction motor Revolutions 2,900 to 1,450 r.p.m. at 50 Hz 3,480 to 1,740 r.p.m. at 60 Hz
HEADS		
REC/PLAY HEAD	:	In-line 4-track stereo/monaural Gap . . . . . 4/1000 mm Impedance . . . . . 3,600 ohms at 1,000 Hz
ERASE HEAD	:	In-line 4-track stereo Gap . . . . . 0.1 mm Impedance . . . . . 3,600 ohms at 90 kHz
RECORD LEVEL INDICATOR	:	Vertical indicating model "A" VU meter
TRANSISTORS	:	2SC693U (F) x 4 2SC870 (E or D) x 2 2SC711 (E or D) x 2 2SC1013 (C, D) x 4 2SC971 (2, 3) x 2
DIODES	:	10DC-1 (Red) x 2 10DC-1 (Blk) x 2 1N34A x 2
REELS	:	7",5" reels can be used.

II. MEASURING METHODS

TAPE SPEED DEVIATION

1. Pre-recorded tape measuring method

Playback on the tape recorder being tested, a tape pre-recorded at 1,000 Hz ±0.1%.

Connect the appropriate output to a frequency count meter in order to measure any deviation from the pre-recorded tape.

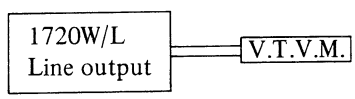
2. Timing tape measuring method
   (designed for tape speed measurement)

This method utilizes a timing tape marked at intervals of 7-1/2". Playing time over 60 marked sections is measured in order to calculate tape speed deviation. In using this method, however, it should be kept in mind that timing tape stretch or contract error is inevitable, so that it is necessary to measure the total length of the tape in advance.

WOW AND FLUTTER

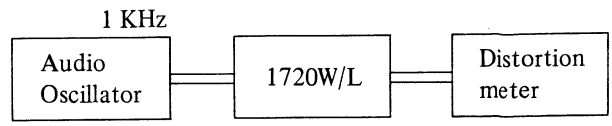
Playback a 3,000 Hz pre-recorded tape, of which the wow and flutter level is guaranteed to be smaller than 0.07%, and measure with a wow meter. It is also possible for a 3,000 Hz sine wave to be recorded and played back for measurement with a wow meter. In this case, however, the wow meter will indicate a value as much as twice that given in the specifications.

SIGNAL TO NOISE RATIO



Set the Equalizer Switch to the "7-1/2 ips" position and playback a tape containing a 250 Hz sine wave recorded at "0" VU level on any standard recorder. Connect a V.T.V.M. to the line output jack of the recorder and measure its output. Next, remove the tape and measure the noise level under the same conditions. Convert each of the measured values into decibels.

TOTAL HARMONIC DISTORTION FACTOR



Connect the measuring instruments as shown above, and record a 1,000 Hz sine wave at "0" VU. Playback the resultant signal and measure the overall distortion factor. Measure the noise level of the tape recorder with the tape removed ; connect the audio oscillator directly to the distortion meter for measurement of the distortion factor of the oscillator.

The resultant distortion factor can be obtained from the results of the above measurement by using the following formula.

$$d_0 = d - d_1 - d_2$$

where, d_0 = Required
d = Overall distortion factor
d_1 = Noise level
d_2 = Distortion factor of the oscillator

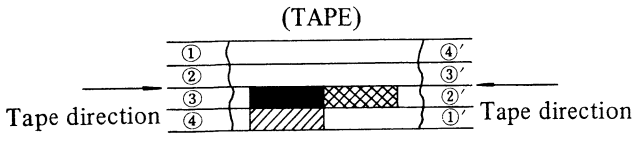
(Note : New tape of particularly good quality should be used for measurment of the distortion factor).

POWER OUTPUT

Playback a tape containing a sine wave of 250 Hz recorded at "0" VU on any standard recorder.

Connect a V.T.V.M. to the line output jack of the recorder and measure the voltage at the output of the recorder being tested.

CROSS TALK (Cross talk between the tracks)

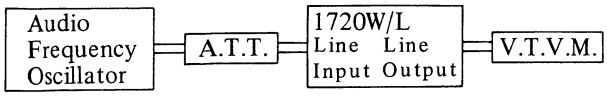


As shown in the figure, first record a 1,000 Hz sine wave on track No. 3 at +3 VU level. Next, remove the 1,000 Hz input signal and record under a non-input condition. Then, playback the tape on tracks 3 and 1 (reversed condition of tape) through the 1,000 Hz B.P.F. (Band Pass Filter, Sensitivity ... 1 : 1) and obtain the ratio between the two by using the following formula.

$$C = 20 \log \frac{E_0}{E_2 - E_1} \text{ (db)}$$

C = Desired cross talk ratio (db)
E_0 = 1,000 Hz signal output level
E_2 = 1,000 Hz cross talk output level
E_1 = Non-input signal record level

FREQUENCY RESPONSE



Connect the measuring instruments as shown in the above diagram, and measure the frequency response in the following sequence :

RECORD :

1) Introduce a sine wave of 1,000 Hz to the Line Input of the recorder being tested through an attenuator from an audio frequency generator.
2) Set the Record/Playback Lever to "Rec" position and adjust the line input volume so that the VU meter needle indicates "0" VU.
3) Under the conditions described in (2), lower the input level 16 dB with the attenuator.
4) Record the spot frequency from the audio frequency generator in the range of 40 to 15,000 Hz.

PLAYBACK :

5) Set the Record/Playback Lever to "Play" position.
6) Connect a V.T.V.M. to the Line Output.
7) Playback the previously recorded tape.
8) Adjust the output level to "0" dBm at 1,000 Hz (indicated on range selector of V.T.V.M.).
9) Playback the recorded spot frequencies under the conditions in (8) ; make a memo of Output Level and plot the value on a graph.

III. CONTROL LOCATIONS

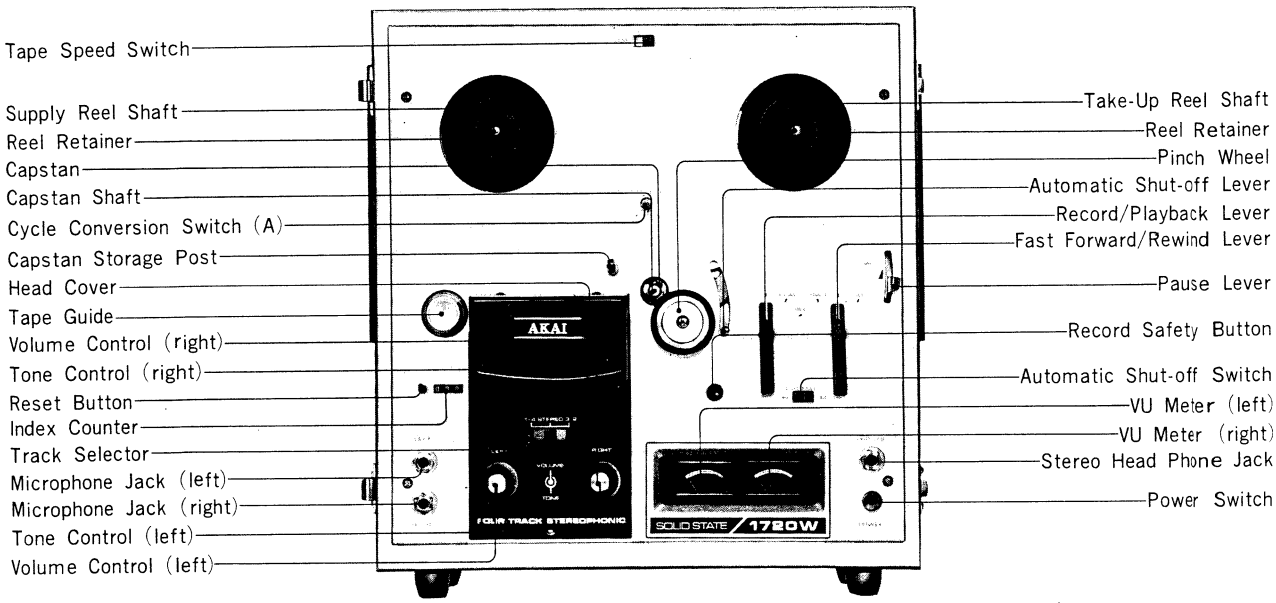


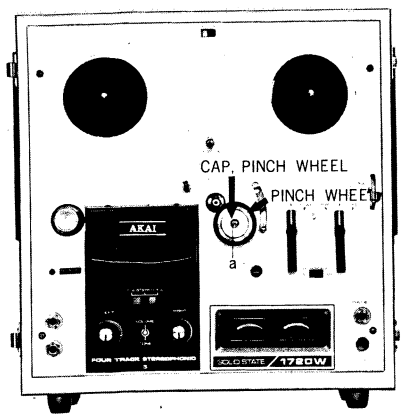
Fig. 1

Fig. 2

IV. DISMANTLING OF TAPE TRANSPORT UNIT & AMPLIFIERS

In case of trouble, etc. necessitating disassembly, please disassemble in the order shown in photographs. Reassemble in reverse order.

1



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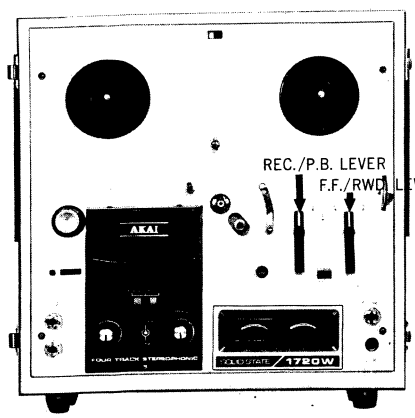

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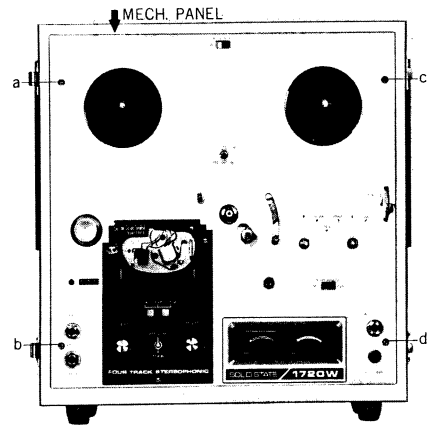

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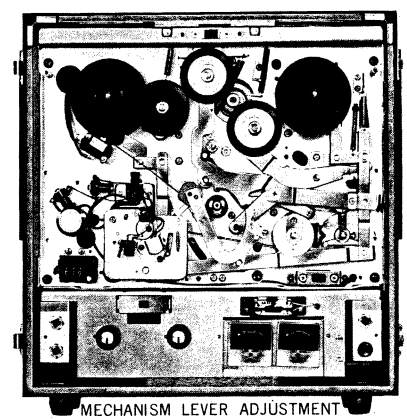

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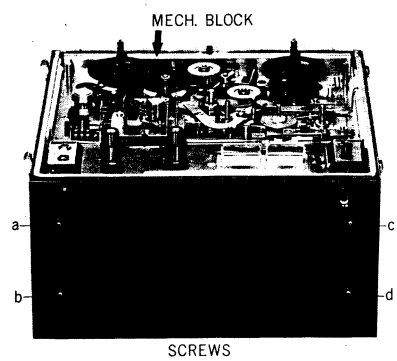

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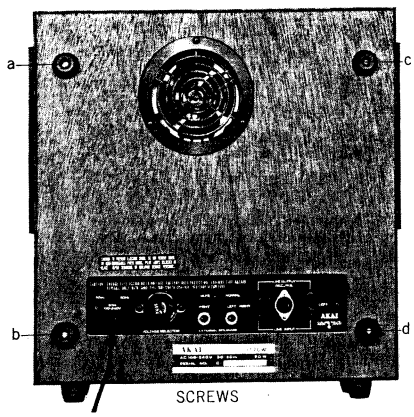
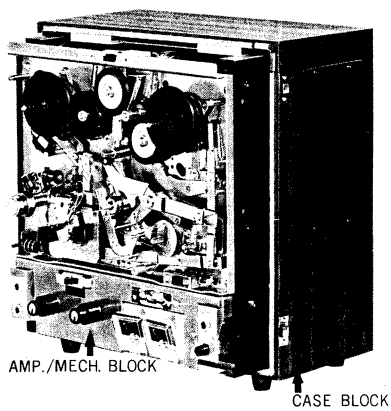
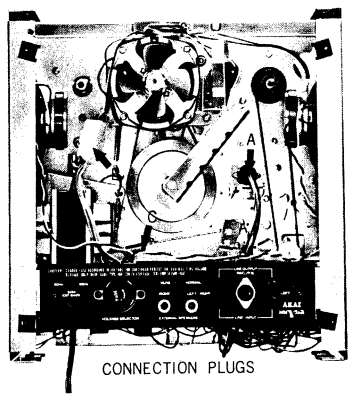

a
c
b
d
SCREWS

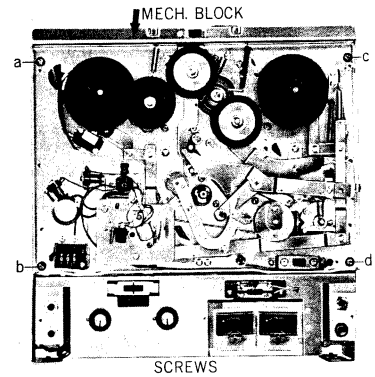
8


AMP./MECH. BLOCK
CASE BLOCK

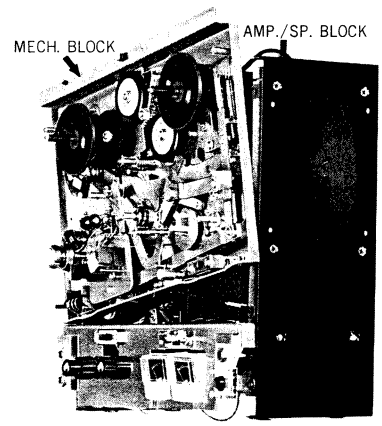
9


CONNECTION PLUGS

10


MECH. BLOCK
a
c
b
d
SCREWS

11


MECH. BLOCK
AMP./SP. BLOCK

V. TRANSPORT MECHANISM

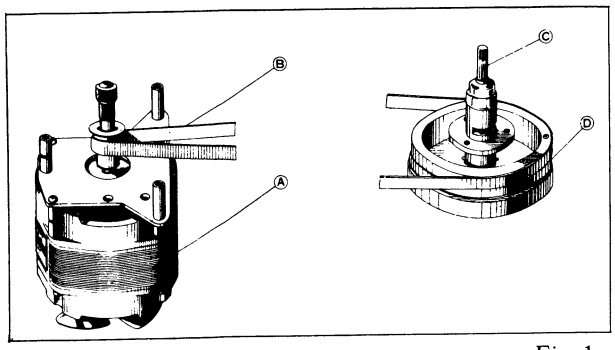


Fig. 1

1. CAPSTAN DRIVE

Figure 1.

(A) Motor
(B) Drive Belt (flat belt)
(C) Capstan
(D) Flywheel

High-speed rotation of Motor (A) is transmitted by Drive Belt (B) to Capstan (C) ; which is connected to a flywheel that provides necessary inertia. This flywheel maintains the rated rotation and absorbs minor rotation variations of the motor.

Capstan Rotation :

606 R.P.M. at 7-1/2" (19 cm) per sec.
303 R.P.M. at 3-3/4" (9.5 cm) per sec.
151.5 R.P.M. at 1-7/8" (4.75 cm) per sec.

Motor Rotation :

3,000 to 1,500 R.P.M. at 50 Hz
3,600 to 1,800 R.P.M. at 60 Hz

2. PINCH WHEEL DRIVE

The pressure of the pinch wheel as it pushes against capstan, transports tape between rotating capstan and pinch wheel at the rated speed. The proper pinch wheel pressure is between 1,000 to 1,150 grams at the tape speed of 7-1/2" (19 cm) per second.

3. RECORD AND PLAYBACK MECHANISM

Turning the RECORD/PLAYBACK LEVER (A) to "PLAY" position causes the pinch wheel to press against the capstan and move the tape at the rated speed. At the same time, *Idler* (B) moves between *Motor Bushing* (C) and the *Take-Up Reel Spindle* (D) to transmit *the motor rotation to* (D) so that the tape is moved and wound on the take-up reel. The Take-up Reel Spindle Base, composed of two plastic wheels (discs) (1 and 2) with a felt clutch between, is rotated from below by the idler. Tape-winding friction is adjusted by the slipping of the felt and maintains rated winding of the tape. *The Supply Reel Spindle* (H) has a *Brake Roller* (E) contacting plastic wheel (disc) (4) from below which provides appropriate back tension by the slipping of the felt clutch to the rotation of the Pulley (3) above. To prevent accidental erasure, *the Record Safety Button* (F) must be depressed before the RECORD/PLAYBACK LEVER can be moved to the "REC" position. *Safety device* (G) is depressed to operate the recording mechanism.

(See figure 2)

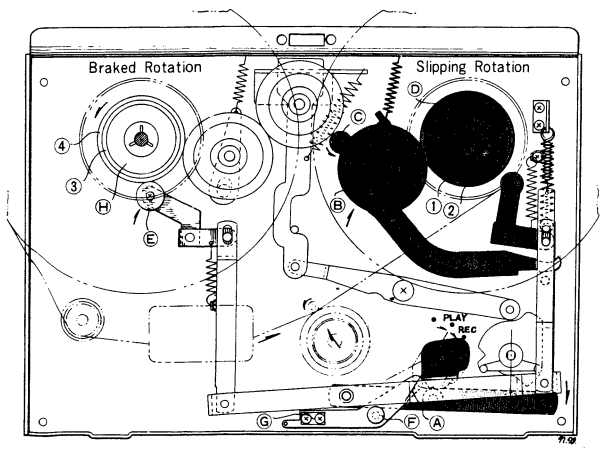


Fig. 2

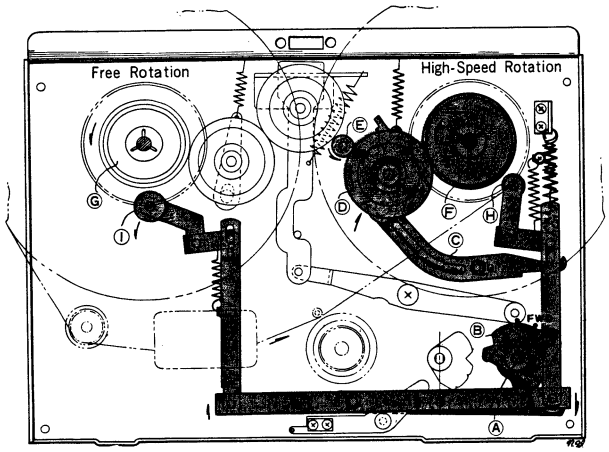


Fig. 3

4. FAST-FORWARD MECHANISM

Turning *the FAST FWD-REWIND LEVER* (A) to "FAST FWD" position, causes *can* (B) under the knob to push up *Lever* (C). *Idler* (D) moves into the space between *Plastic Roller* (F) above the Take-Up Reel Spindle and the upper part of the rotating motor drive bushing to transmit the motor rotation to the take-up reel spindle. At the same time, *Brake Rollers* (H) and (I) come off the reel spindle to free *Supply Reel Spindles* (G) and (F), thereby allowing fast winding of the tape onto the take-up reel.
(See figure 3)

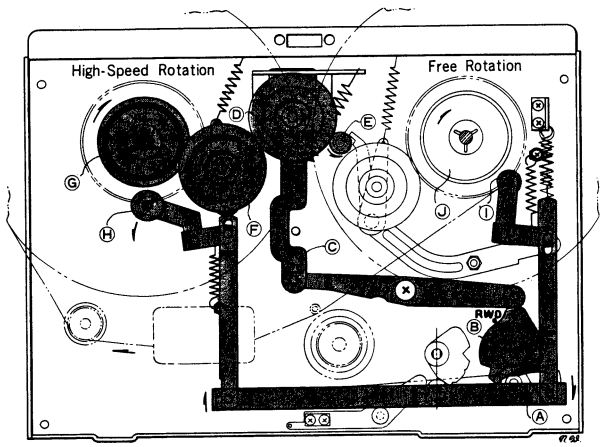


Fig. 4

5. REWIND MECHANISM

Turning *the FAST FWD-REWIND knob* (A) to "REWIND" position, causes *cam* (B) under the knob *to push up Lever* (C). *Idler* (D) moves into the space between the upper part of the rotating *Motor drive bushing* (E) and *the Intermediate Pulley* (F) to transmit the high-speed rotation of the motor through the intermediate pulley to *Supply Reel Spindle* (G). At the same time, *Brake Rollers* (H) and (I) come off the reel spindle to free *take-up reel spindles* (J) and (G), thereby rewinding the tape onto the supply reel at a fast speed.
(See figure 4)

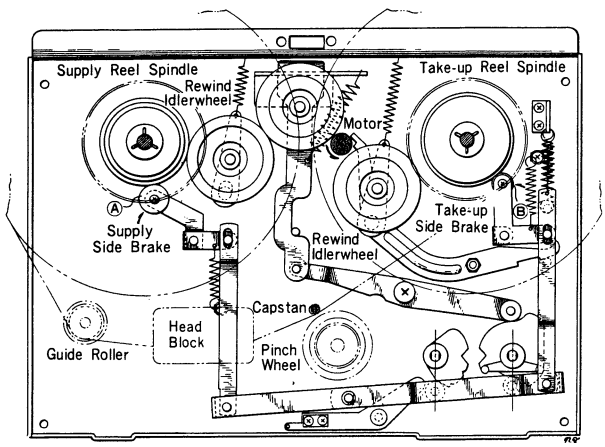


Fig. 5

6. STOP CONTROL

Turning the stop lever to "STOP" position, causes *Brake Rollers* (A) and (B) to depress the reel spindles and stop rotation.
As the brake rubbers depress the plastic rollers below the reel spindles, no friction is applied to the tape.
(See figure 5)

Modes of Operation	Pinch Wheel	Take-up Idler Wheel	Rewind Idler Wheel	Take-up side Brake	Supply side Brake
(a) STOP	X	X	X	○	○
(b) FAST-FORWARD	X	○	X	X	X
(c) REWIND	X	X	○	X	X
(d) RECORDING PLAYBACK	○	○	X	X	○

NOTES : X-marks indicates "open" and
○-marks "engaged"

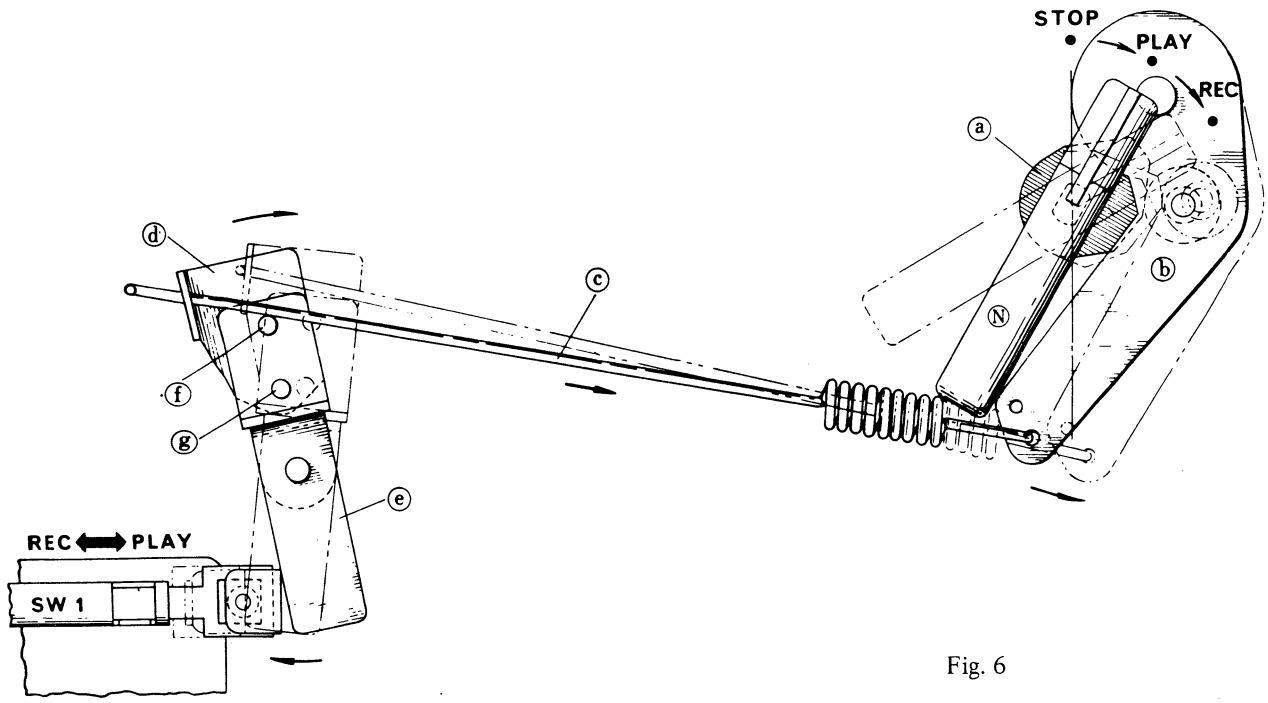


Fig. 6

RECORD/PLAYBACK CHANGING MECHANISM

When the RECORD/PLAYBACK LEVER (N) is turned to play position, RECORD/PLAYBACK CHANGING SWITCH (SW1) does not operate and remains fixed in play mode.

By turning the RECORD/PLAYBACK LEVER (N) to the recording position, CAM (a) pushes ARM (b), as illustrated by the dotted line. ARM (b) then pulls ARMS (d) and (e), which are joined to the RECORD/PLAYBACK CHANGING SWITCH (SW1), to the recording position.

If ARMS (b), (d) and (e) do not work properly, (SW1) does not operate properly, abnormal oscillation may occur, and recording cannot take place. The ARMS must be adjusted properly by loosening SCREWS (f) and (g).

VI. MECHANISM ADJUSTMENT

1. PINCH WHEEL ADJUSTMENT

It is important that the pinch wheel shaft be kept in perfect alignment with the capstan shaft. Proper pinch wheel pressure is between 1,000 and 1,150 grams when the unit is operated at the tape speed of 7½ ips. Any deviation will result in wow and flutter. Check pinch wheel pressure with a spring scale, and if necessary, adjust the pinch wheel load spring.

2. TAKE-UP IDLER WHEEL ADJUSTMENT

The take-up idler wheel must be kept in perfect alignment with the take-up reel shaft. In fast forward operation, the idler wheel contacts the upper knurled wheel of the take-up reel shaft assembly, and conversely contacts the lower knurled wheel during record or play operation. Adjust idler wheel load spring so that the idler wheel pressure is kept between 50 and 80 grams. The idler wheel wears rapidly if the pressure is excessive. Slippage occurs if the pressure is less than specified.

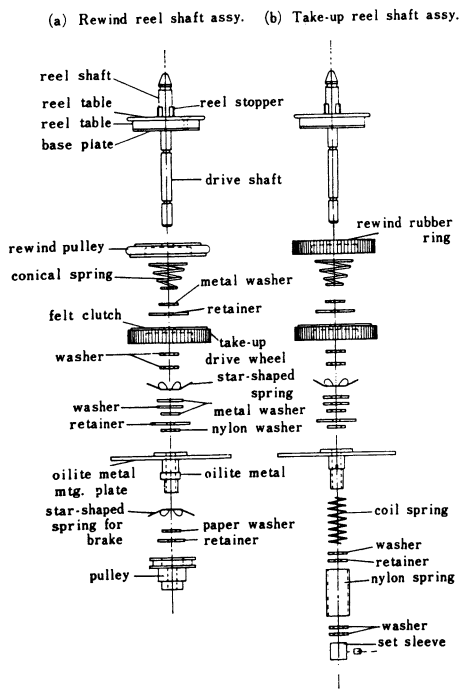


Fig. 1

3. REWIND IDLER WHEEL ADJUSTMENT

The rewind idler wheel must be kept in perfect alignment with the rewind reel shaft. The amount of pressure on the knurled motor bushing should be about 50 grams during rewind operation. Adjust both the idler load spring and rewind roller.

4. INTERMEDIATE WHEEL ADJUSTMENT

The intermediate wheel is located between the rewind idler wheel and the rubber ring which is used on the upper part of the supply reel shaft assembly. In rewind mode, it contacts these parts while simultaneously transmitting motor torque. An adequate pressure is 50 grams. Adjust the load spring of the intermediate wheel if the pressure is not sufficient.

5. TAKE-UP REEL SHAFT ASSEMBLY ADJUSTMENT

A felt clutch is attached to the bottom side of the reel table base plate so that recording tape will not stretch due to excessive tension during fast forward operation. To check the amount of friction on this part, install a 5-inch reel with a 60 mm diameter tape and gently pull the end of the tape upward with a spring scale. Adjust the conical spring so that the amount of tension on this part is between 350 to 450 grams. Another felt clutch is attached to the take-up drive wheel to provide proper slippage during record or play mode. The procedure for checking friction of this part is same as the foregoing, and between 150 and 200 grams of friction provides the best results. Adjust the star-shaped spring just under the take-up drive wheel. During rewind operation, the amount of friction of this part will decrease to 10 to 15 grams. Check to see whether this is satisfactory. If not, readjust the star-shaped brake spring and the pressure of the spring retainer washer accordingly.

6. SUPPLY REEL SHAFT ASSEMBLY ADJUSTMENT

A felt clutch is used between the lower side of the reel table base plate and the rewind rubber ring to protect the recording tape from excessive tension during recording. To check the amount of friction on this part, install a 5-inch reel with a 60 mm diameter tape, and gently pull the end of tape upward with a spring scale. Adjust the conical spring so the tension is between 350 a 450 grams. Another felt clutch is attached to the rewind drive wheel to provide proper slipping operation during record or play mode. The procedure for checking friction on this part is the same as the foregoing, and between 110 and 130 grams of friction gives best results. In fast forward operation, the amount of friction will decrease to 10 to 15 grams.
Check to see whether this is correct. If not, readjust coil spring and spring retainer washer. (See figure 1 (a) at left)

7. HEAD ADJUSTMENT

(A) Adjustment of Head Height (See Fig. 2 and 3)

a. Erase Head

Adjust the Erase Head Height by turning head height screws (a) (a') so that the upper edge of the tape as it passes the erase head is 0.125 to 0.15 mm below the top edge of the CH-1 erase head core.

b. Playback Head

Adjust the Playback Head Height by turning head height screws (b) (b') in the same manner so that the upper edge of the tape as it passes the playback head is exactly parallel with the top edge of the playback head core.

(B) Adjustment of Vertical Azimuth of the Head

Adjust the vertical azimuth of each head (erase and playback) by turning head height screws (a) (a') and (b) (b') until the tape comes in complete contact with each head.

(C) Adjustment of Head Alignment

Playback Head

Playback an Ampex Alignment tape (8,000 Hz) at 3-3/4 ips and turn alignment control screw (c) until the output level of both channels reaches maximum.

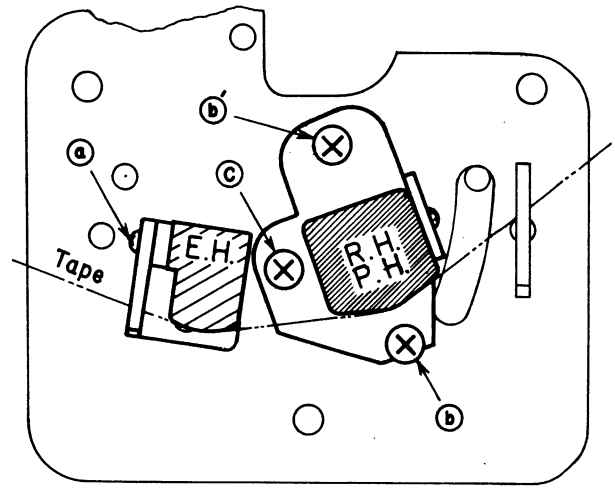


Fig. 2

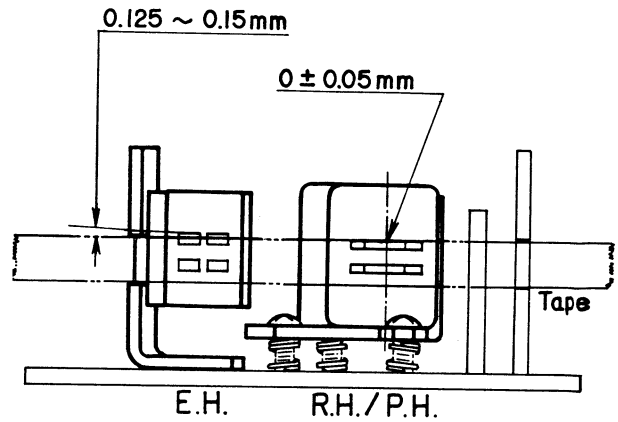


Fig. 3

VII. AMPLIFIER ADJUSTMENT

1. RECORDING BIAS FREQUENCY ADJUSTMENT (Fig. 1)

a. Install a resistor of 10 or 50 Ohms in series with the Bias Head and connect the Vertical Input Terminal of the Oscilloscope to points (a) and (b).
b. Feed in a sine wave signal from and Audio Frequency Oscillator to the Horizontal Input of the Oscilloscope and tune the Dial of the Audio Frequency Oscillator until the Oscilloscope displays a circular or linear pattern.
c. A reading of 63 KHz ± 5KHz, indicates that the Recording Bias Frequency is correct.
d. If incorrect, it can be adjusted by inserting another condenser (C216) value 5500PF.

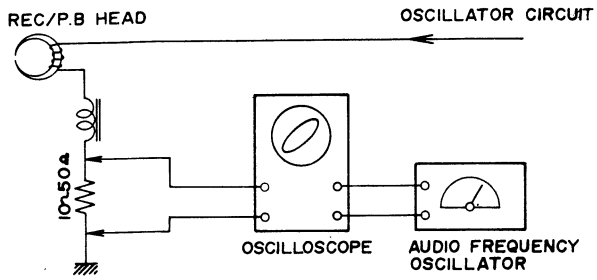


Fig. 1

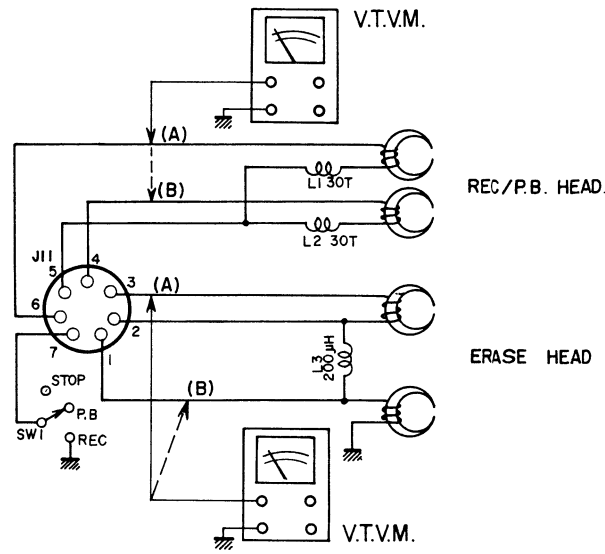


Fig. 2

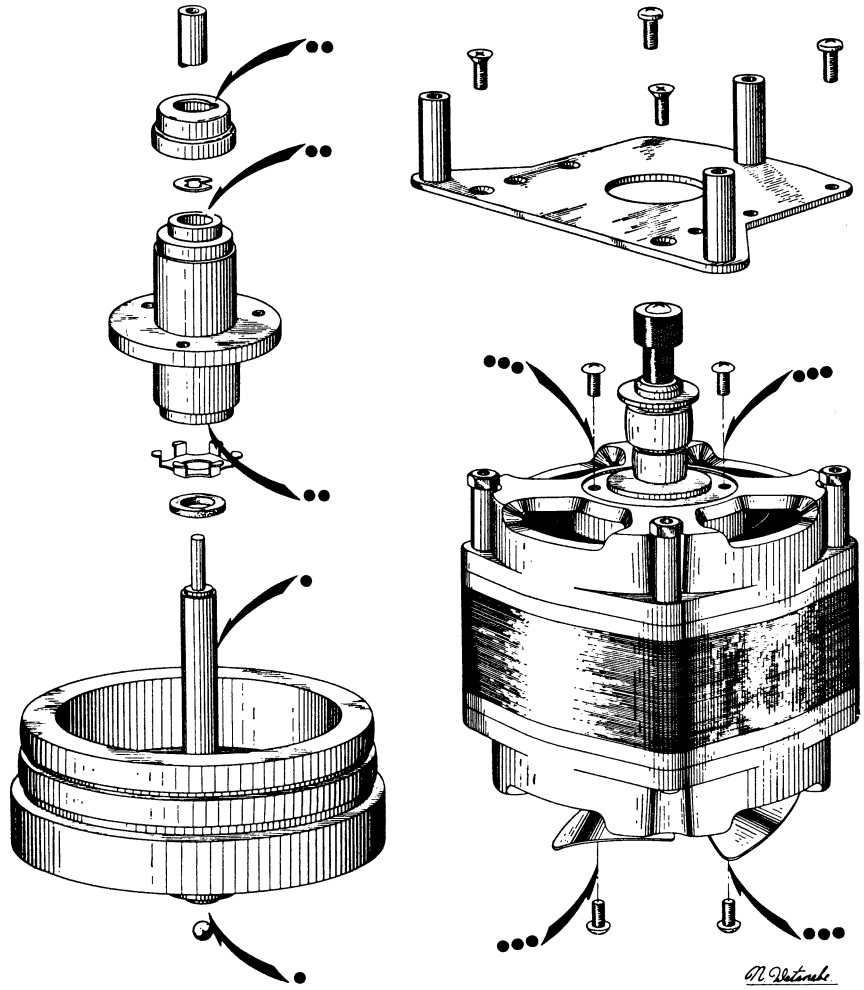
2. RECORDING BIAS VOLTAGE (Fig. 2)

a. Connect the V.T.V.M. to points (A) and (B), then read the value on the V.T.V.M.
b. A reading of AC 35 V ± 2 V, indicates that the Recording Bias Voltage is correct.

3. ERASING BIAS VOLTAGE (Fig. 2)

a. Connect the V.T.V.M. to points (A) and (B), then read the value on the V.T.V.M.
b. A reading of AC 22 to 30 V, indicates that the Erasing Bias Voltage is correct.

VIII. MAINTENANCE PROCEDURES



FLYWHEEL ● 1 drop MOTOR

1. LUBRICATION INSTRUCTIONS

For maximum service life and optimum performance, lubricate the following parts after each 500 hours of operation. Use only light machine oil of good quality.

Motor	
Flywheel Assembly	
Rewind Idler Wheel and Wind Take-Up Idler	1 drop
Intermediate Idler	1 drop
Pinch Wheel	1 drop

Also apply a liberal film of light machine grease to each roller surface of all levers and cams.

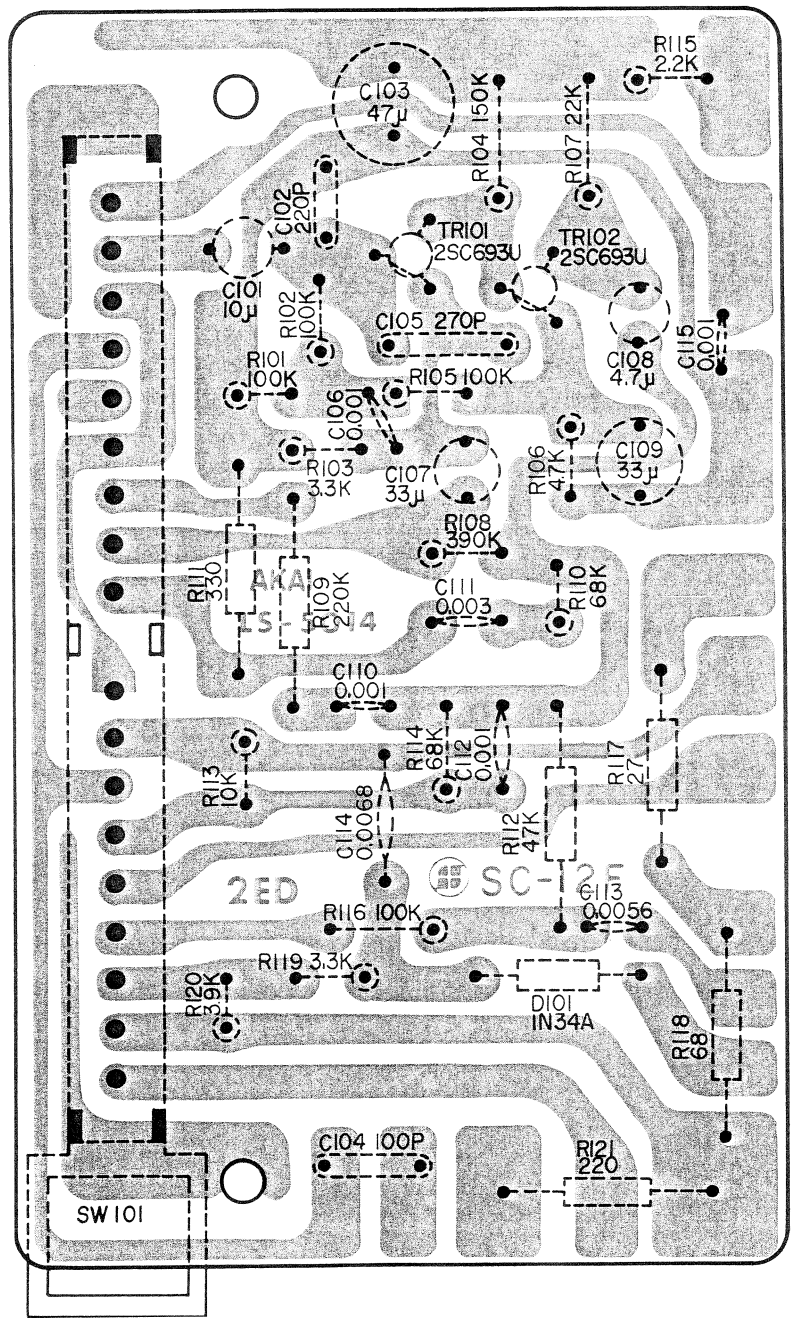
CAUTION : DO NOT OVER-LUBRICATE. WIPE OFF EXCESS OIL WITH A COTTON SWAB SOAKED IN ALCOHOL. OTHERWISE EXCESS LUBRICANT MAY BE SCATTERED DURING OPERATION AND THE RUBBER COMPONENTS WILL DETERIORATE.

2. CLEANING TAPE HEADS AND OTHER PARTS

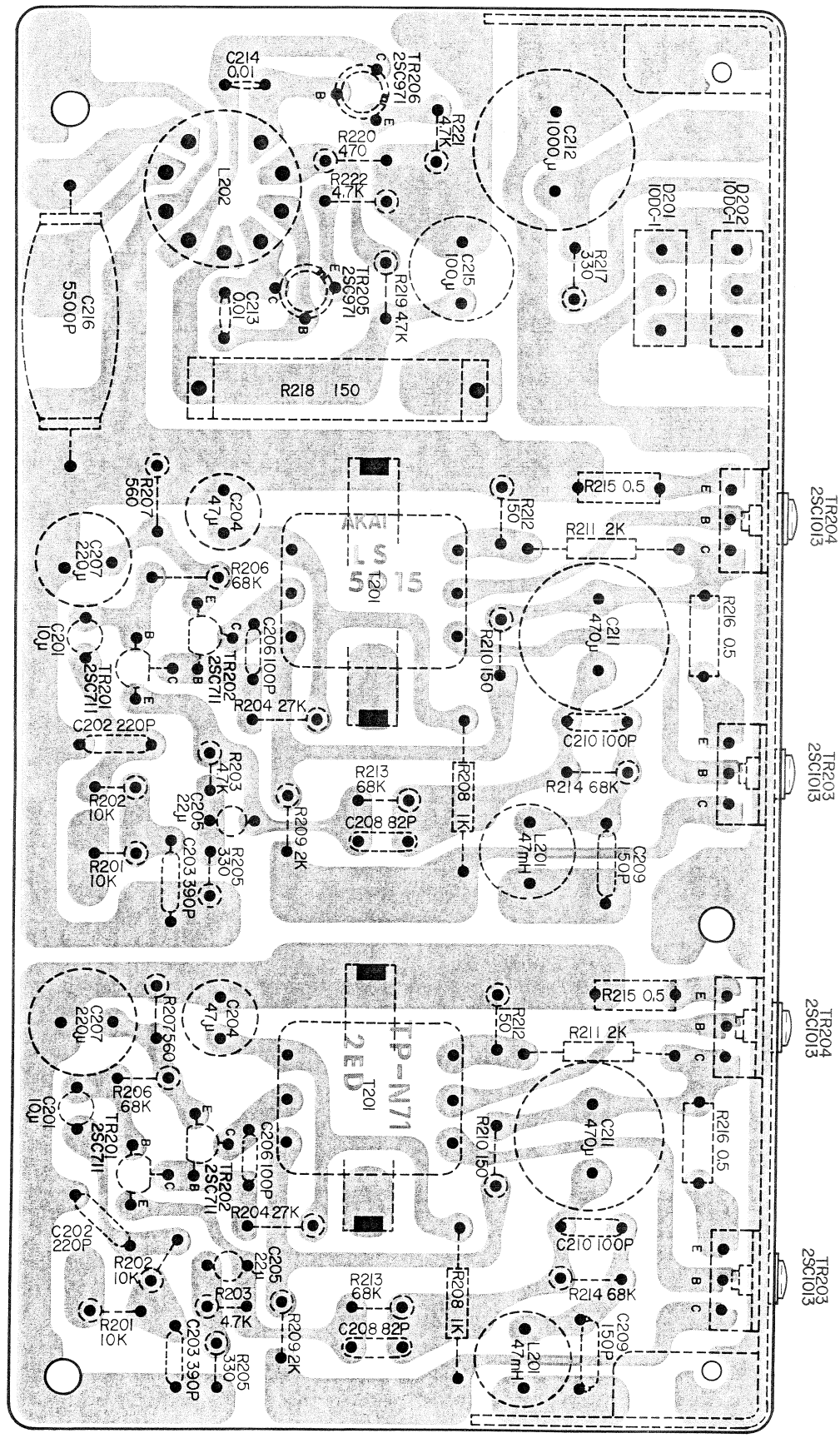
Wipe surface of tape heads, guide roller bearing, capstan bushing and pinch wheel periodically with a soft cloth soaked in alcohol.

IX. COMPOSITE VIEWS OF COMPONENTS

PRE-AMPLIFIER P.C. BOARD (LS-5014)



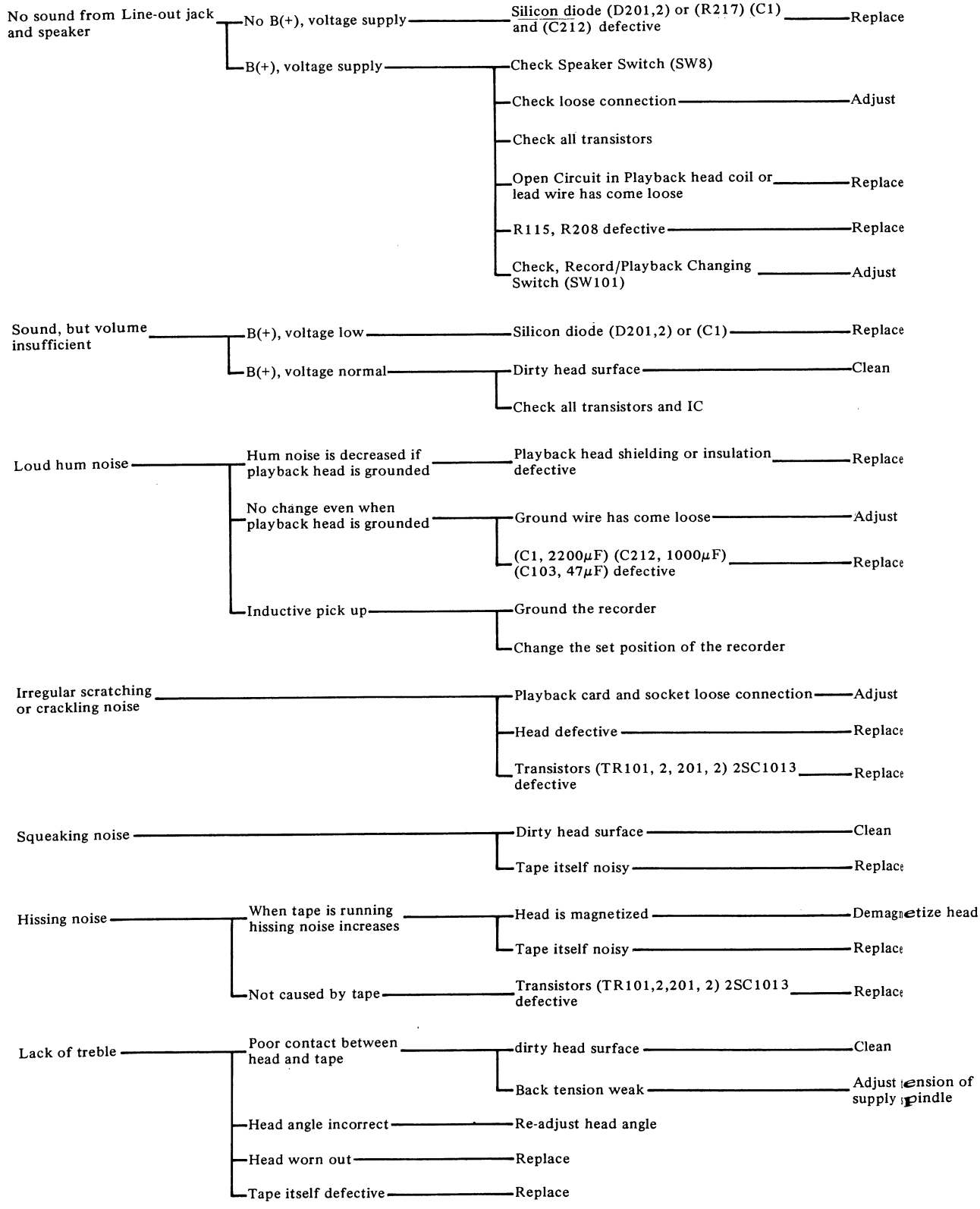
MAIN AMPLIFIER P.C. BOARD (LS-5015)

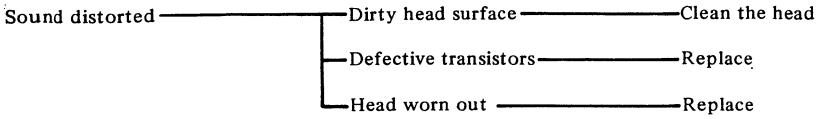


X. TROUBLE SHOOTING CHART

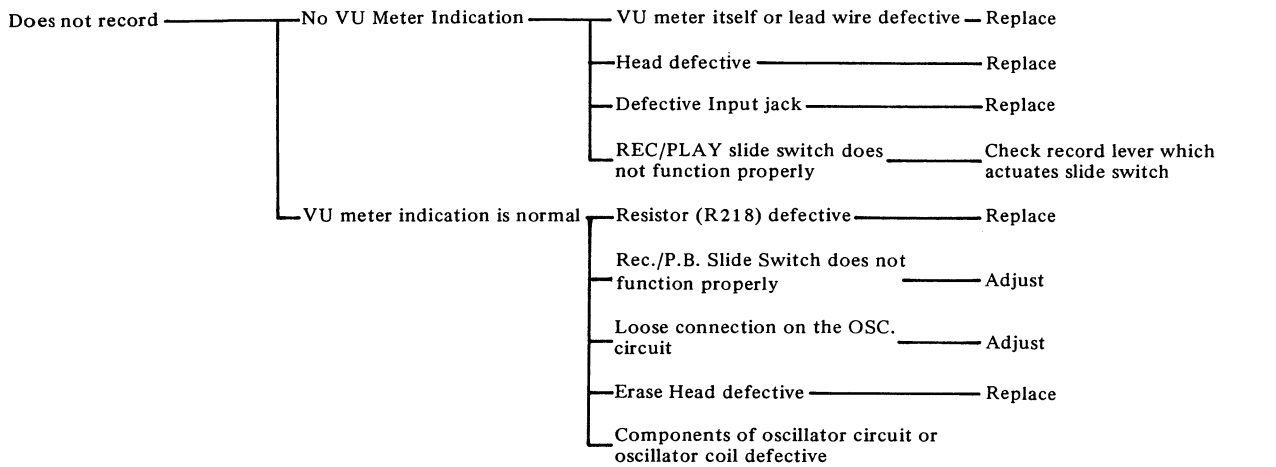
SECTION "A" TROUBLES WITH AMPLIFIER

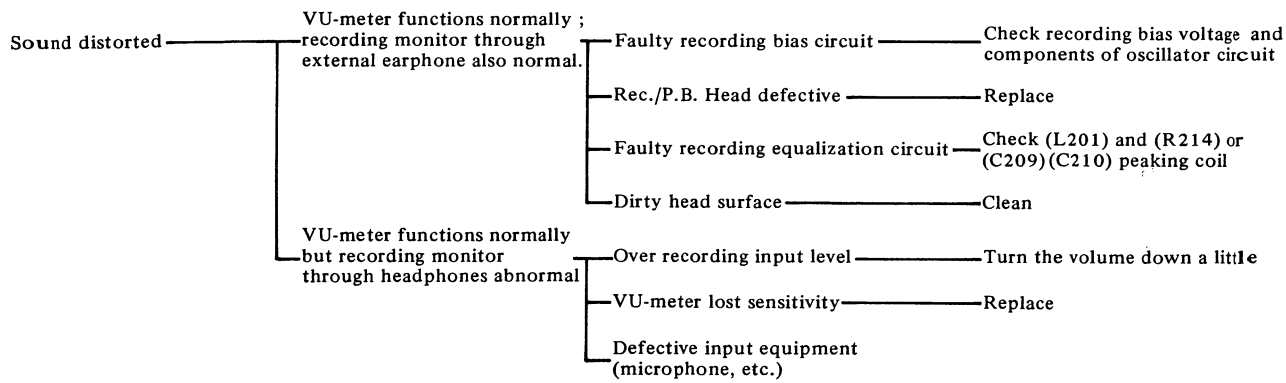
1. Playback problems. (Unit set to play position.)

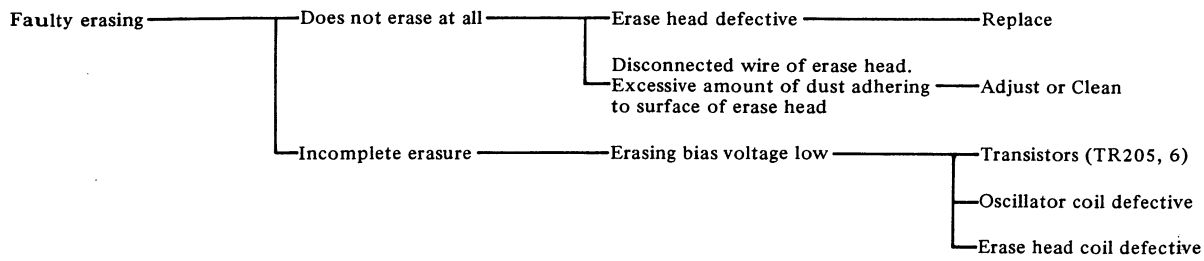


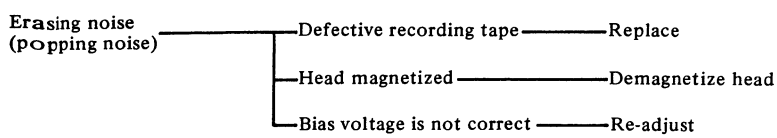


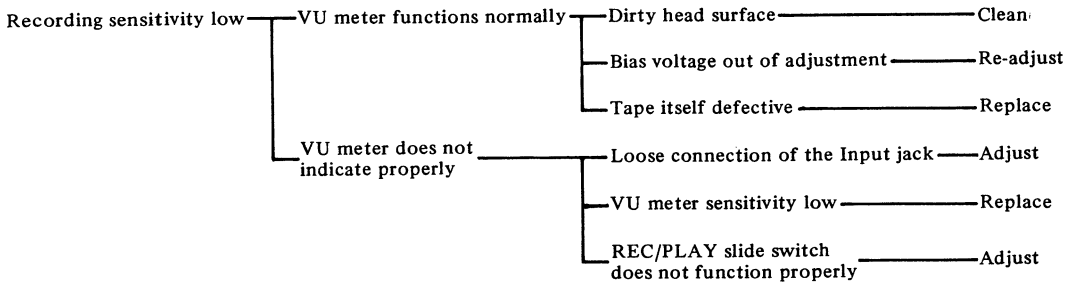
2. Recording problems.
(Unit plays back pre-recorded tape satisfactorily, but recording unsatisfactory.)

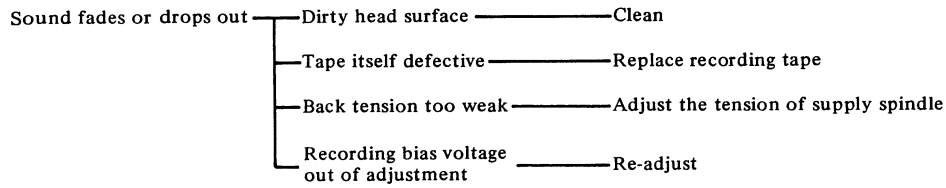


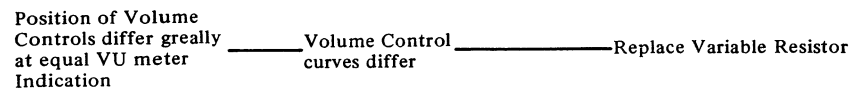

Sound distorted
VU-meter functions normally ; recording monitor through external earphone also normal.
Faulty recording bias circuit
Check recording bias voltage and components of oscillator circuit
Rec./P.B. Head defective
Replace
Faulty recording equalization circuit
Check (L201) and (R214) or (C209)(C210) peaking coil
Dirty head surface
Clean
VU-meter functions normally but recording monitor through headphones abnormal
Over recording input level
Turn the volume down a little
VU-meter lost sensitivity
Replace
Defective input equipment (microphone, etc.)





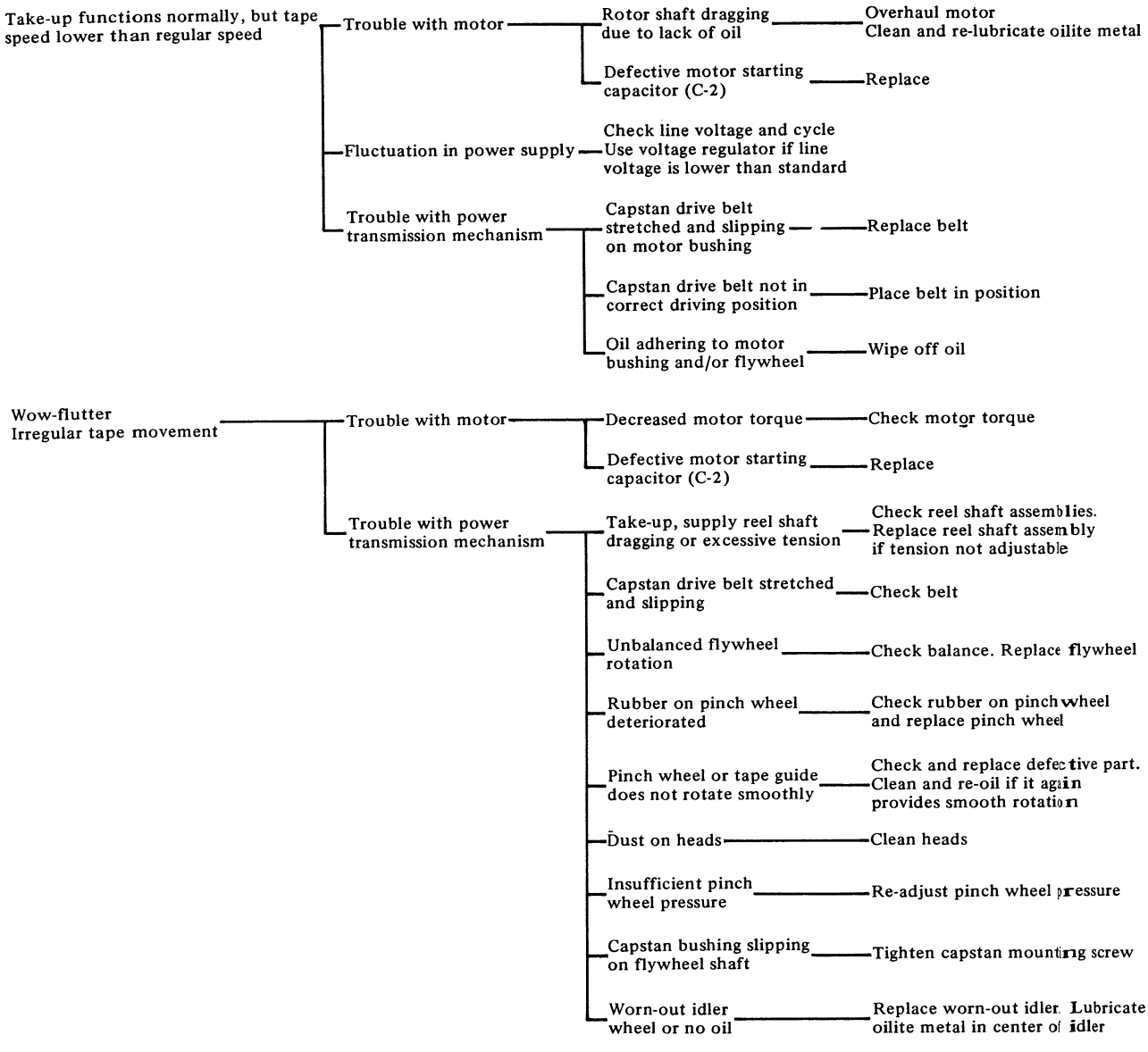

Recording sensitivity low
VU meter functions normally
Dirty head surface
Clean
Bias voltage out of adjustment
Re-adjust
Tape itself defective
Replace
VU meter does not indicate properly
Loose connection of the Input jack
Adjust
VU meter sensitivity low
Replace
REC/PLAY slide switch does not function properly
Adjust

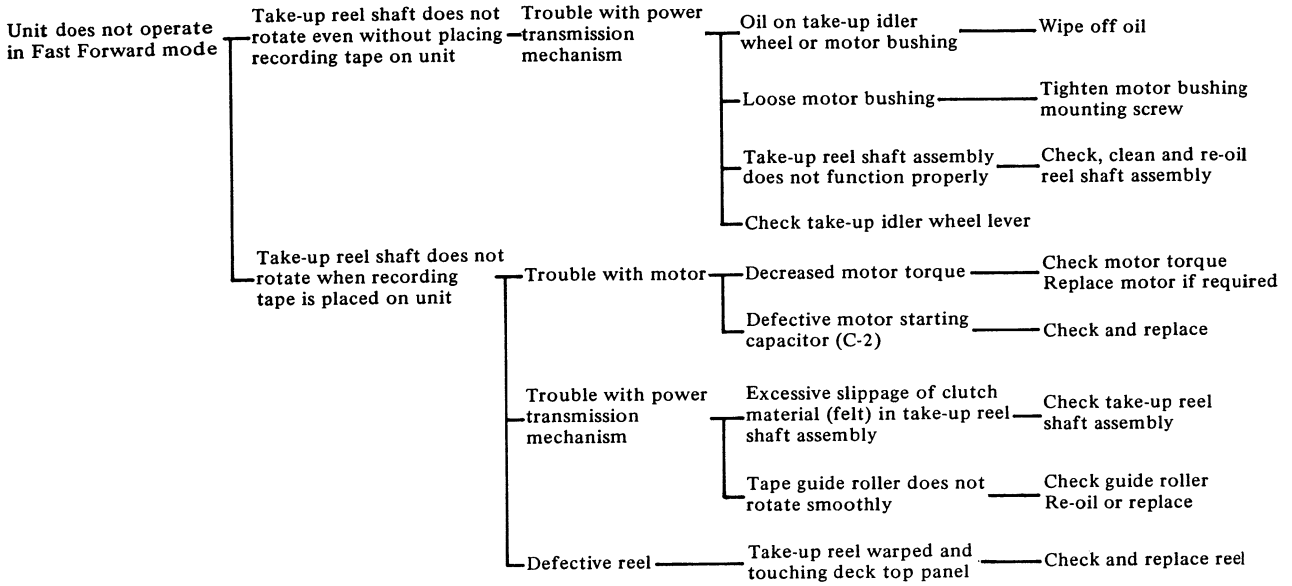

Sound fades or drops out
Dirty head surface
Clean
Tape itself defective
Replace recording tape
Back tension too weak
Adjust the tension of supply spindle
Recording bias voltage out of adjustment
Re-adjust

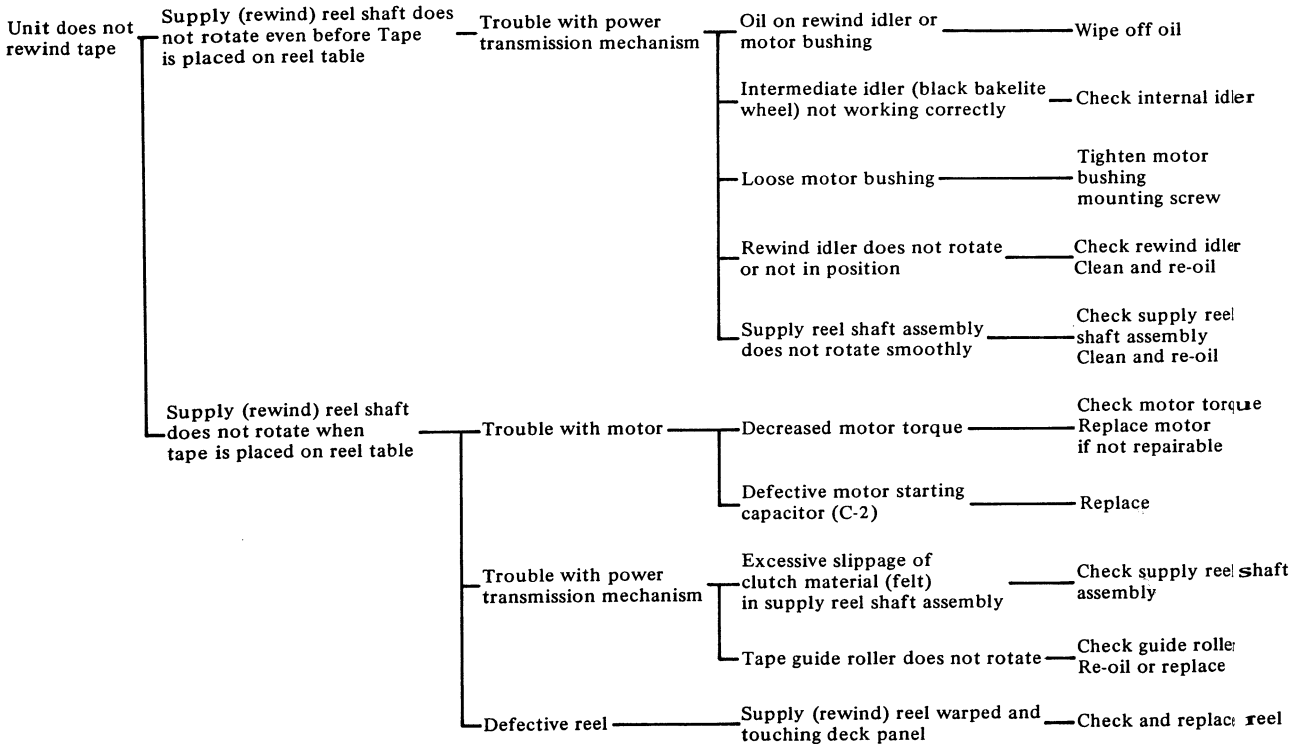

Position of Volume Controls differ greally at equal VU meter Indication
Volume Control curves differ
Replace Variable Resistor

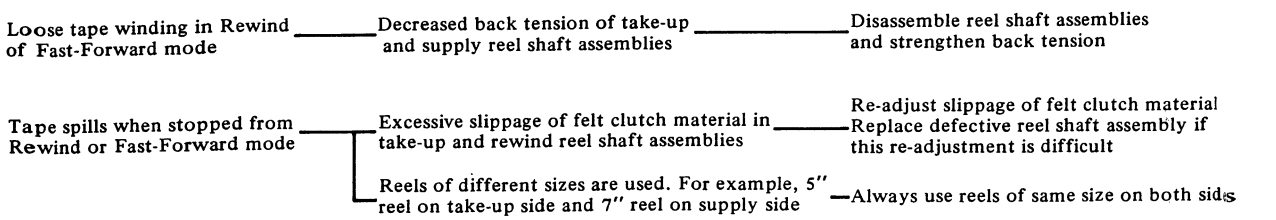
SECTION "B" TROUBLES WITH TAPE TRANSPORT MECHANISM

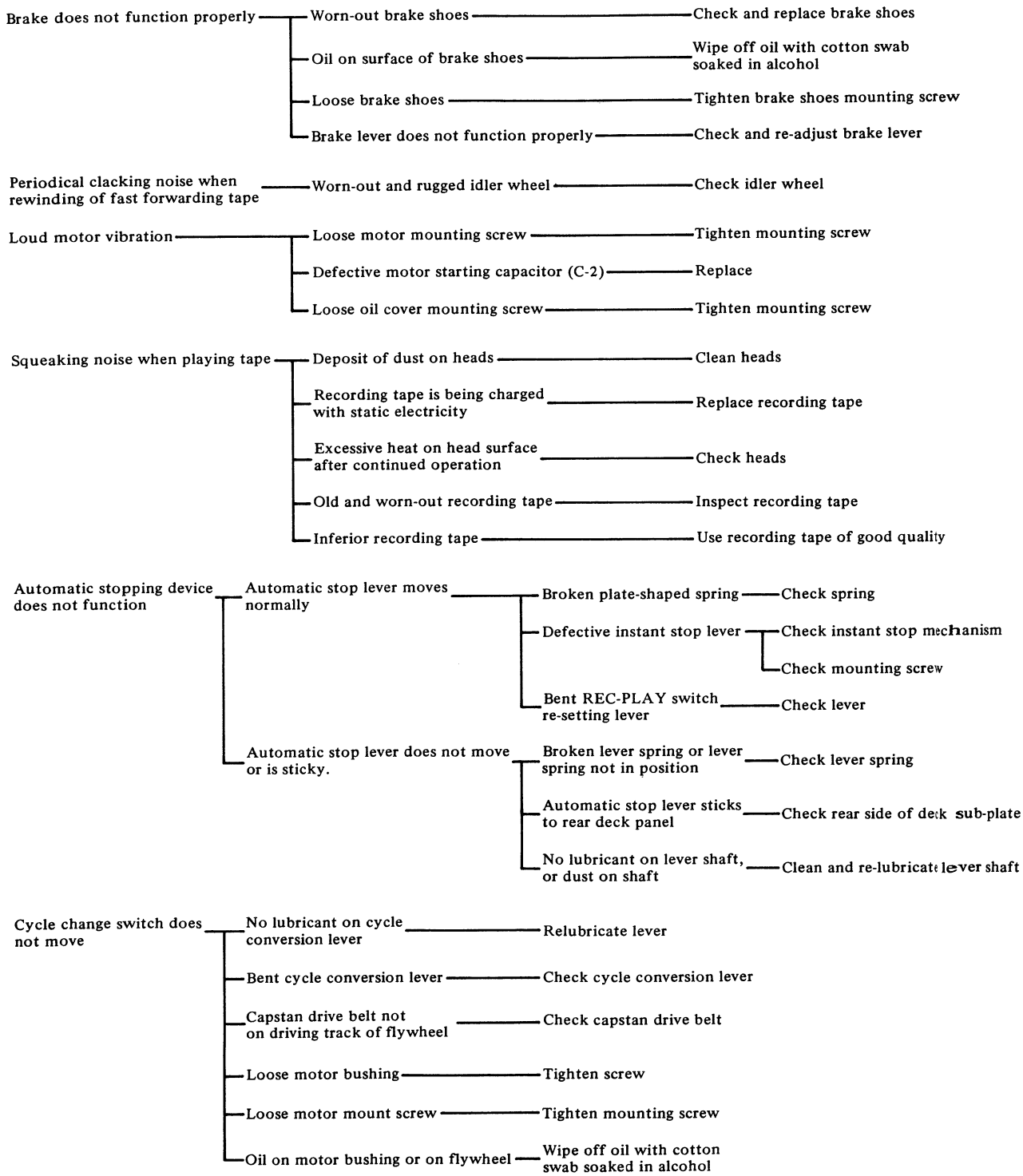
Capstan does not rotate
Motor does not rotate
(P12, J12) poor connection
Repair
Motor trouble
Broken field coil
Check field coil with tester, and replace motor if coil is broken.
Defective motor starting capacitor (C-2)
Replace
Rotor shaft dragging due to lack of oil
Overhaul motor. Clean and re-lubricate oilite metal
Some foreign matter exists between rotor and stator
Check and eliminate foreign matter for free rotation of rotor
Trouble with power transmission mechanism
Broken capstan drive belt
Replace belt
Capstan drive belt off of driving position
Place belt in position
Motor bushing slipping on motor shaft
Tighten mounting screw
Oil on motor bushing and/or flywheel
Wipe off oil with cotton swab soaked in alcohol
Capstan rotates in Stop position, but tape does not advance when switched to play position
Trouble with motor
Decreased motor torque
Check motor torque and replace motor
Difective (C-2)
Replace
Motor bushing slipping on motor shaft
Tighten mounting screw
Trouble with power transmission mechanism
Capstan drive belt stretched
Replace belt
Oil on motor bushing and/or flywheel
Wipe off oil
Capstan bushing slipping on flywheel shaft
Tighten capstan mounting screw
Excessive tension in Take-up /Supply reel table assembly
Re-adjust tension
Oil adhering to capstan and/or pinch wheel
Wipe off oil
Insufficient pinch wheel pressure
Check and re-adjust pinch wheel pressure
Capstan advances tape, but take-up reel does not take up tape
Reel shaft dragging due to lack of oil
Check take-up reel shaft assembly
Take-up idler wheel does not rotate properly
Check idler wheel
Replace if necessary
Oil on idler wheel and/or roller on take-up reel shaft assembly
Wipe off oil
Take-up idler wheel poor contact
Check idler tension spring
Replace spring if necessary
Check take-up idler wheel lever


Take-up functions normally, but tape speed lower than regular speed
Trouble with motor
Rotor shaft dragging due to lack of oil
Overhaul motor
Clean and re-lubricate oilite metal
Defective motor starting capacitor (C-2)
Replace
Fluctuation in power supply
Check line voltage and cycle
Use voltage regulator if line voltage is lower than standard
Trouble with power transmission mechanism
Capstan drive belt stretched and slipping on motor bushing
Replace belt
Capstan drive belt not in correct driving position
Place belt in position
Oil adhering to motor bushing and/or flywheel
Wipe off oil
Wow-flutter
Irregular tape movement
Trouble with motor
Decreased motor torque
Check motor torque
Defective motor starting capacitor (C-2)
Replace
Trouble with power transmission mechanism
Take-up, supply reel shaft dragging or excessive tension
Check reel shaft assemblies.
Replace reel shaft assembly if tension not adjustable
Capstan drive belt stretched and slipping
Check belt
Unbalanced flywheel rotation
Check balance. Replace flywheel
Rubber on pinch wheel deteriorated
Check rubber on pinch wheel and replace pinch wheel
Pinch wheel or tape guide does not rotate smoothly
Check and replace defective part.
Clean and re-oil if it again provides smooth rotation
Dust on heads
Clean heads
Insufficient pinch wheel pressure
Re-adjust pinch wheel pressure
Capstan bushing slipping on flywheel shaft
Tighten capstan mounting screw
Worn-out idler wheel or no oil
Replace worn-out idler. Lubricate oilite metal in center of idler

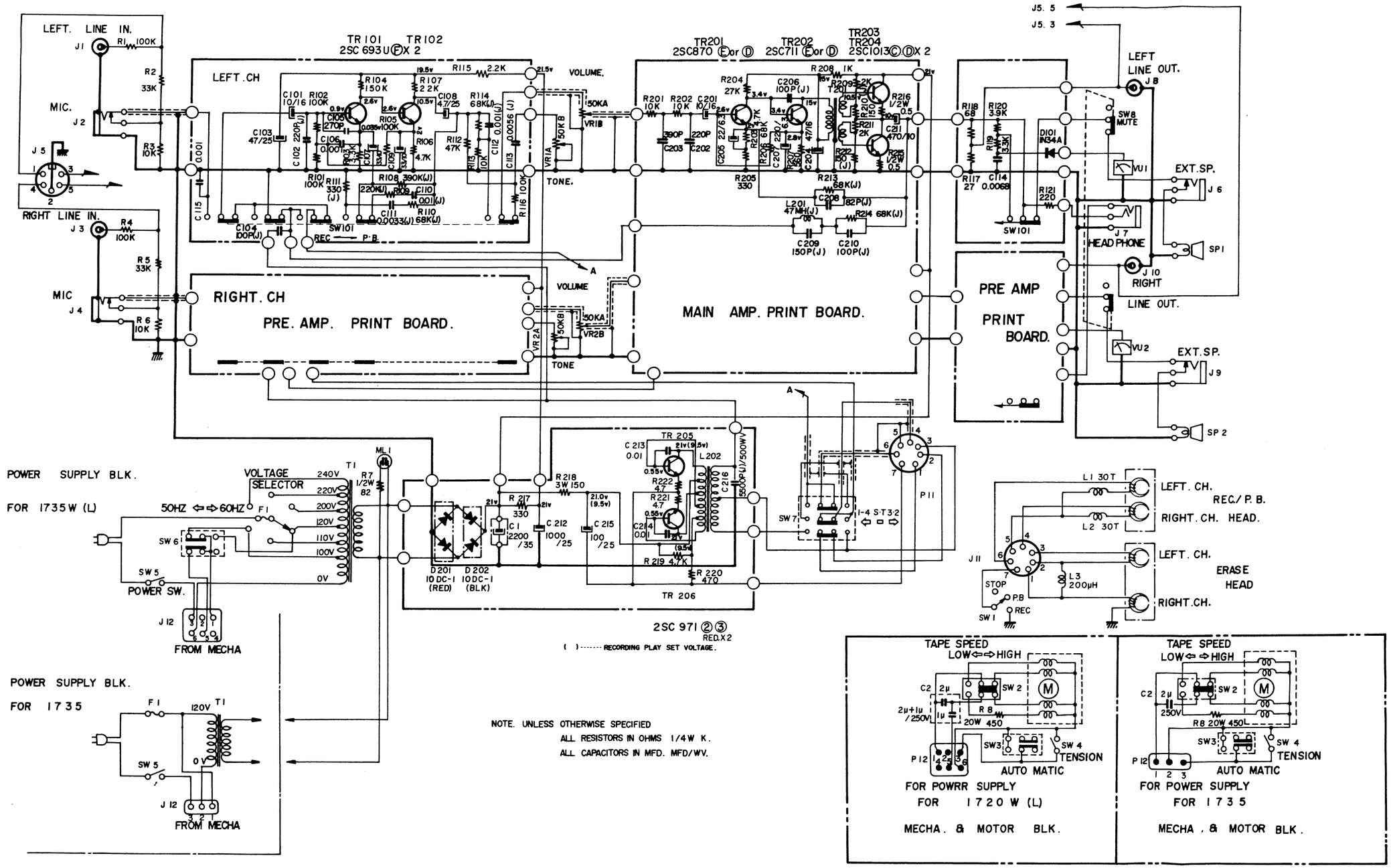

Unit does not operate in Fast Forward mode
Take-up reel shaft does not rotate even without placing recording tape on unit
Trouble with power transmission mechanism
Oil on take-up idler wheel or motor bushing
Wipe off oil
Loose motor bushing
Tighten motor bushing mounting screw
Take-up reel shaft assembly does not function properly
Check, clean and re-oil reel shaft assembly
Check take-up idler wheel lever
Take-up reel shaft does not rotate when recording tape is placed on unit
Trouble with motor
Decreased motor torque
Check motor torque Replace motor if required
Defective motor starting capacitor (C-2)
Check and replace
Trouble with power transmission mechanism
Excessive slippage of clutch material (felt) in take-up reel shaft assembly
Check take-up reel shaft assembly
Tape guide roller does not rotate smoothly
Check guide roller Re-oil or replace
Defective reel
Take-up reel warped and touching deck top panel
Check and replace reel


Unit does not rewind tape
Supply (rewind) reel shaft does not rotate even before Tape is placed on reel table
Trouble with power transmission mechanism
Oil on rewind idler or motor bushing
Wipe off oil
Intermediate idler (black bakelite wheel) not working correctly
Check internal idler
Loose motor bushing
Tighten motor bushing mounting screw
Rewind idler does not rotate or not in position
Check rewind idler Clean and re-oil
Supply reel shaft assembly does not rotate smoothly
Check supply reel shaft assembly Clean and re-oil
Supply (rewind) reel shaft does not rotate when tape is placed on reel table
Trouble with motor
Decreased motor torque
Check motor torque Replace motor if not repairable
Defective motor starting capacitor (C-2)
Replace
Trouble with power transmission mechanism
Excessive slippage of clutch material (felt) in supply reel shaft assembly
Check supply reel shaft assembly
Tape guide roller does not rotate
Check guide roller Re-oil or replace
Defective reel
Supply (rewind) reel warped and touching deck panel
Check and replace reel


Loose tape winding in Rewind of Fast-Forward mode
Decreased back tension of take-up and supply reel shaft assemblies
Disassemble reel shaft assemblies and strengthen back tension
Tape spills when stopped from Rewind or Fast-Forward mode
Excessive slippage of felt clutch material in take-up and rewind reel shaft assemblies
Re-adjust slippage of felt clutch material Replace defective reel shaft assembly if this re-adjustment is difficult
Reels of different sizes are used. For example, 5" reel on take-up side and 7" reel on supply side
Always use reels of same size on both sides


Brake does not function properly
Worn-out brake shoes
Check and replace brake shoes
Oil on surface of brake shoes
Wipe off oil with cotton swab soaked in alcohol
Loose brake shoes
Tighten brake shoes mounting screw
Brake lever does not function properly
Check and re-adjust brake lever
Periodical clacking noise when rewinding of fast forwarding tape
Worn-out and rugged idler wheel
Check idler wheel
Loud motor vibration
Loose motor mounting screw
Tighten mounting screw
Defective motor starting capacitor (C-2)
Replace
Loose oil cover mounting screw
Tighten mounting screw
Squeaking noise when playing tape
Deposit of dust on heads
Clean heads
Recording tape is being charged with static electricity
Replace recording tape
Excessive heat on head surface after continued operation
Check heads
Old and worn-out recording tape
Inspect recording tape
Inferior recording tape
Use recording tape of good quality
Automatic stopping device does not function
Automatic stop lever moves normally
Broken plate-shaped spring
Check spring
Defective instant stop lever
Check instant stop mechanism
Check mounting screw
Bent REC-PLAY switch re-setting lever
Check lever
Automatic stop lever does not move or is sticky.
Broken lever spring or lever spring not in position
Check lever spring
Automatic stop lever sticks to rear deck panel
Check rear side of deck sub-plate
No lubricant on lever shaft, or dust on shaft
Clean and re-lubricate lever shaft
Cycle change switch does not move
No lubricant on cycle conversion lever
Relubricate lever
Bent cycle conversion lever
Check cycle conversion lever
Capstan drive belt not on driving track of flywheel
Check capstan drive belt
Loose motor bushing
Tighten screw
Loose motor mount screw
Tighten mounting screw
Oil on motor bushing or on flywheel
Wipe off oil with cotton swab soaked in alcohol

MEMO



1720W SCHEMATIC DIAGRAM 140146-21

III. CONTROL LOCATIONS

Fig. 1

Fig. 2

IV. DISMANTLING OF TAPE TRANSPORT UNIT & AMPLIFIERS

In case of trouble, etc. necessitating disassembly, please disassemble in the order shown in photographs. Reassemble in reverse order.

1

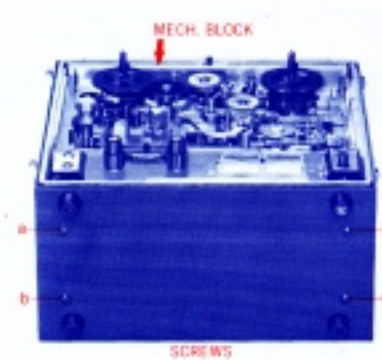
2

3

4

5

6



7

a
c
b
d
SCREWS

8

AMP./MECH. BLOCK
CASE BLOCK

9

CONNECTION PLUGS

10

MECH. BLOCK
a
c
b
d
SCREWS

11

MECH. BLOCK
AMP./SP. BLOCK

V. TRANSPORT MECHANISM

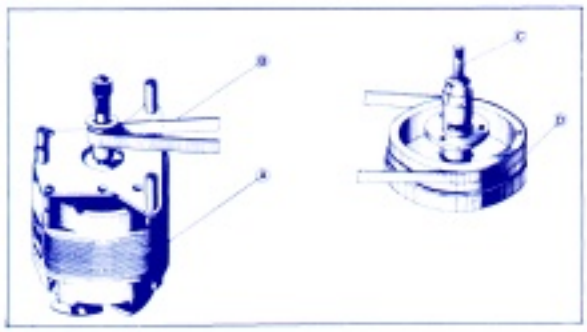


Fig. 1

1. CAPSTAN DRIVE

Figure 1.

(A) Motor
(B) Drive Belt (flat belt)
(C) Capstan
(D) Flywheel

High-speed rotation of Motor (A) is transmitted by Drive Belt (B) to Capstan (C); which is connected to a flywheel that provides necessary inertia. This flywheel maintains the rated rotation and absorbs minor rotation variations of the motor.

Capstan Rotation :

606 R.P.M. at 7-1/2" (19 cm) per sec.
303 R.P.M. at 3-3/4" (9.5 cm) per sec.
151.5 R.P.M. at 1-7/8" (4.75 cm) per sec.

Motor Rotation :

3,000 to 1,500 R.P.M. at 50 Hz
3,600 to 1,800 R.P.M. at 60 Hz

2. PINCH WHEEL DRIVE

The pressure of the pinch wheel as it pushes against capstan, transports tape between rotating capstan and pinch wheel at the rated speed. The proper pinch wheel pressure is between 1,000 to 1,150 grams at the tape speed of 7-1/2" (19 cm) per second.

3. RECORD AND PLAYBACK MECHANISM

Turning the RECORD/PLAYBACK LEVER (A) to "PLAY" position causes the pinch wheel to press against the capstan and move the tape at the rated speed. At the same time, *Idler* (B) moves between *Motor Bushing* (C) and the *Take-Up Reel Spindle* (D) to transmit *the motor rotation to* (D) so that the tape is moved and wound on the take-up reel. The Take-up Reel Spindle Base, composed of two plastic wheels (discs) (1 and 2) with a felt clutch between, is rotated from below by the idler. Tape-winding friction is adjusted by the slipping of the felt and maintains rated winding of the tape. *The Supply Reel Spindle* (H) has a *Brake Roller* (E) contacting plastic wheel (disc) (4) from below which provides appropriate back tension by the slipping of the felt clutch to the rotation of the Pulley (3) above. To prevent accidental erasure, *the Record Safety Button* (F) must be depressed before the RECORD/PLAYBACK LEVER can be moved to the "REC" position. *Safety device* (G) is depressed to operate the recording mechanism.

(See figure 2)

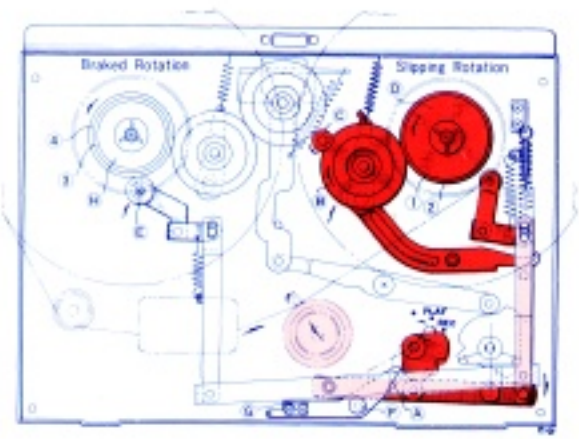


Fig. 2

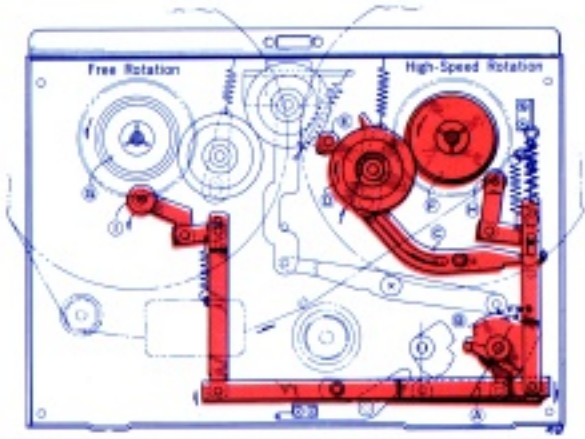


Fig. 3

4. FAST-FORWARD MECHANISM

Turning *the FAST FWD-REWIND LEVER* (A) to "FAST FWD" position, causes *cam* (B) under the knob to push up *Lever* (C). *Idler* (D) moves into the space between *Plastic Roller* (F) above the Take-Up Reel Spindle and the upper part of the rotating motor drive bushing to transmit the motor rotation to the take-up reel spindle. At the same time, *Brake Rollers* (H) and (I) come off the reel spindle to free *Supply Reel Spindles* (G) and (F), thereby allowing fast winding of the tape onto the take-up reel.
(See figure 3)

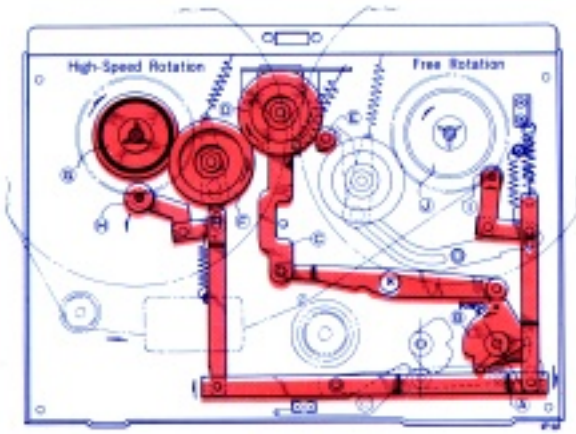


Fig. 4

5. REWIND MECHANISM

Turning *the FAST FWD-REWIND knob* (A) to "REWIND" position, causes *cam* (B) under the knob *to push up Lever* (C). *Idler* (D) moves into the space between the upper part of the rotating *Motor drive bushing* (E) and *the Intermediate Pulley* (F) to transmit the high-speed rotation of the motor through the intermediate pulley to *Supply Reel Spindle* (G). At the same time, *Brake Rollers* (H) and (I) come off the reel spindle to free *take-up reel spindles* (J) and (G), thereby rewinding the tape onto the supply reel at a fast speed.
(See figure 4)

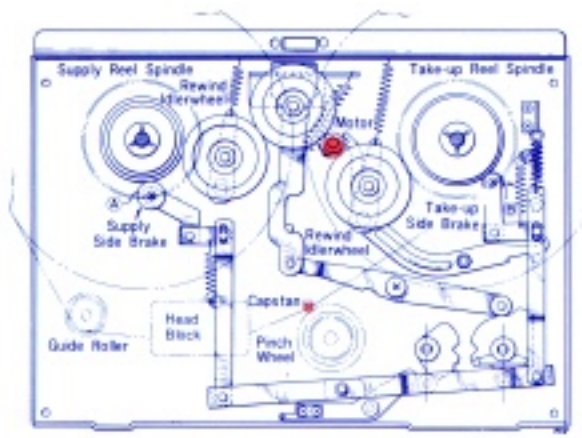


Fig. 5

6. STOP CONTROL

Turning the stop lever to "STOP" position, causes *Brake Rollers* (A) and (B) to depress the reel spindles and stop rotation.
As the brake rubbers depress the plastic rollers below the reel spindles, no friction is applied to the tape.
(See figure 5)

Modes of Operation	Pinch Wheel	Take-up Idler Wheel	Rewind Idler Wheel	Take-up side Brake	Supply side Brake
(a) STOP	X	X	X	○	○
(b) FAST-FORWARD	X	○	X	X	X
(c) REWIND	X	X	○	X	X
(d) RECORDING PLAYBACK	○	○	X	X	○

NOTES : X-marks indicates "open" and
○-marks "engaged"

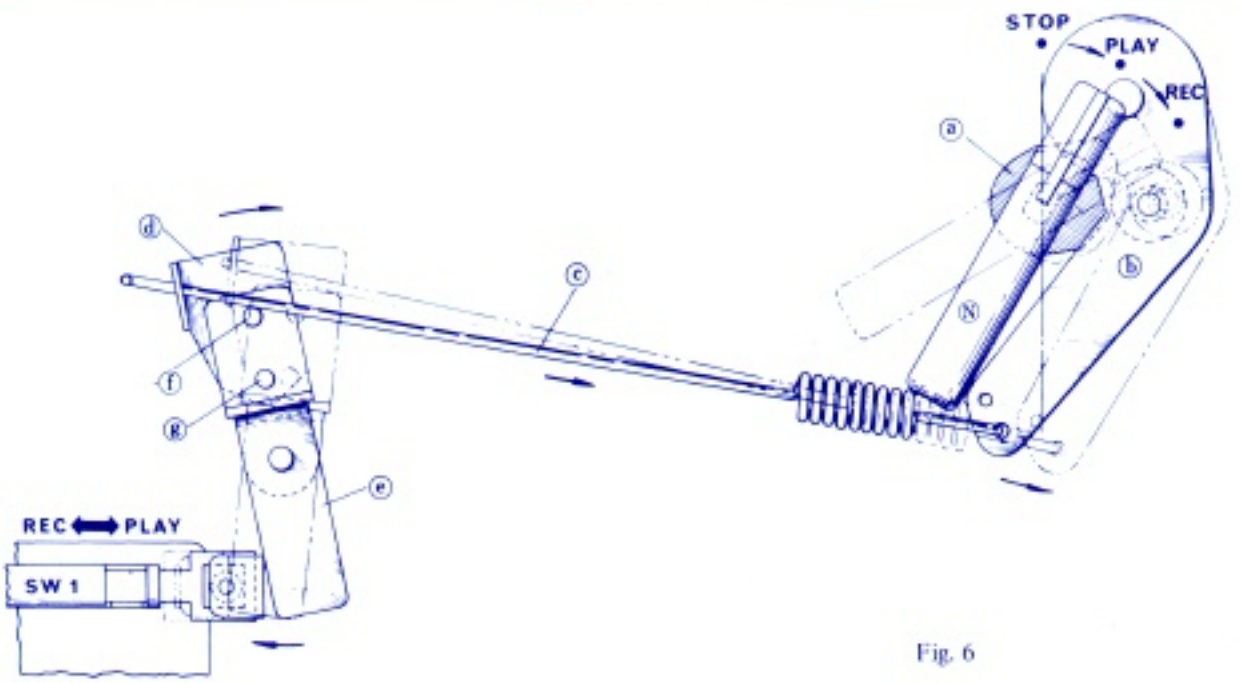


Fig. 6

RECORD/PLAYBACK CHANGING MECHANISM

When the RECORD/PLAYBACK LEVER (N) is turned to play position, RECORD/PLAYBACK CHANGING SWITCH (SW1) does not operate and remains fixed in play mode.

By turning the RECORD/PLAYBACK LEVER (N) to the recording position, CAM (a) pushes ARM (b), as illustrated by the dotted line. ARM (b) then pulls ARMS (d) and (e), which are joined to the RECORD/PLAYBACK CHANGING SWITCH (SW1), to the recording position.

If ARMS (b), (d) and (e) do not work properly, (SW1) does not operate properly, abnormal oscillation may occur, and recording cannot take place. The ARMS must be adjusted properly by loosening SCREWS (f) and (g).

VI. MECHANISM ADJUSTMENT

1. PINCH WHEEL ADJUSTMENT

It is important that the pinch wheel shaft be kept in perfect alignment with the capstan shaft. Proper pinch wheel pressure is between 1,000 and 1,150 grams when the unit is operated at the tape speed of 7½ ips. Any deviation will result in wow and flutter. Check pinch wheel pressure with a spring scale, and if necessary, adjust the pinch wheel load spring.

2. TAKE-UP IDLER WHEEL ADJUSTMENT

The take-up idler wheel must be kept in perfect alignment with the take-up reel shaft. In fast forward operation, the idler wheel contacts the upper knurled wheel of the take-up reel shaft assembly, and conversely contacts the lower knurled wheel during record or play operation. Adjust idler wheel load spring so that the idler wheel pressure is kept between 50 and 80 grams. The idler wheel wears rapidly if the pressure is excessive. Slippage occurs if the pressure is less than specified.

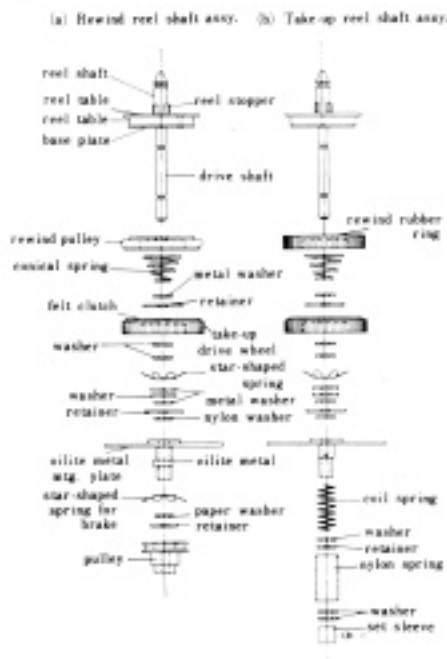


Fig. 1

3. REWIND IDLER WHEEL ADJUSTMENT

The rewind idler wheel must be kept in perfect alignment with the rewind reel shaft. The amount of pressure on the knurled motor bushing should be about 50 grams during rewind operation. Adjust both the idler load spring and rewind roller.

4. INTERMEDIATE WHEEL ADJUSTMENT

The intermediate wheel is located between the rewind idler wheel and the rubber ring which is used on the upper part of the supply reel shaft assembly. In rewind mode, it contacts these parts while simultaneously transmitting motor torque. An adequate pressure is 50 grams. Adjust the load spring of the intermediate wheel if the pressure is not sufficient.

5. TAKE-UP REEL SHAFT ASSEMBLY ADJUSTMENT

A felt clutch is attached to the bottom side of the reel table base plate so that recording tape will not stretch due to excessive tension during fast forward operation. To check the amount of friction on this part, install a 5-inch reel with a 60 mm diameter tape and gently pull the end of the tape upward with a spring scale. Adjust the conical spring so that the amount of tension on this part is between 350 to 450 grams. Another felt clutch is attached to the take-up drive wheel to provide proper slippage during record or play mode. The procedure for checking friction of this part is same as the foregoing, and between 150 and 200 grams of friction provides the best results. Adjust the star-shaped spring just under the take-up drive wheel. During rewind operation, the amount of friction of this part will decrease to 10 to 15 grams. Check to see whether this is satisfactory. If not, readjust the star-shaped brake spring and the pressure of the spring retainer washer accordingly.

6. SUPPLY REEL SHAFT ASSEMBLY ADJUSTMENT

A felt clutch is used between the lower side of the reel table base plate and the rewind rubber ring to protect the recording tape from excessive tension during recording. To check the amount of friction on this part, install a 5-inch reel with a 60 mm diameter tape, and gently pull the end of tape upward with a spring scale. Adjust the conical spring so the tension is between 350 a 450 grams. Another felt clutch is attached to the rewind drive wheel to provide proper slipping operation during record or play mode. The procedure for checking friction on this part is the same as the foregoing, and between 110 and 130 grams of friction gives best results. In fast forward operation, the amount of friction will decrease to 10 to 15 grams.

Check to see whether this is correct. If not, readjust coil spring and spring retainer washer. (See figure 1 (a) at left)

7. HEAD ADJUSTMENT

(A) Adjustment of Head Height (See Fig. 2 and 3)

a. Erase Head

Adjust the Erase Head Height by turning head height screws (a) so that the upper edge of the tape as it passes the erase head is 0.125 to 0.15 mm below the top edge of the CH-1 erase head core.

b. Playback Head

Adjust the Playback Head Height by turning head height screws (b) (b') in the same manner so that the upper edge of the tape as it passes the playback head is exactly parallel with the top edge of the playback head core.

(B) Adjustment of Vertical Azimuth of the Head

Adjust the vertical azimuth of each head (erase and playback) by turning head height screws (a) and (b) (b') until the tape comes in complete contact with each head.

(C) Adjustment of Head Alignment

Playback Head

Playback an Ampex Alignment tape (8,000 Hz) at 3-3/4 ips and turn alignment control screw (c) until the output level of both channels reaches maximum.

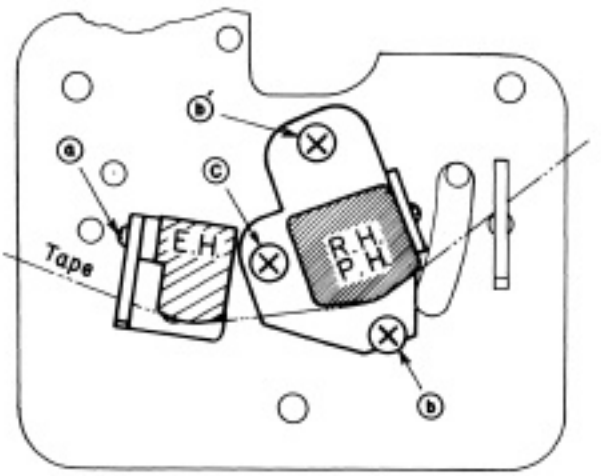


Fig. 2

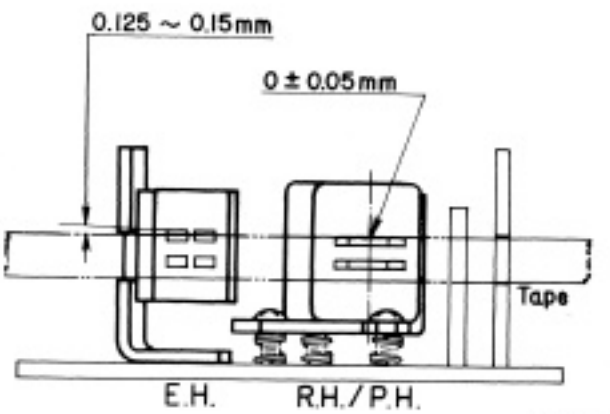


Fig. 3

VII. AMPLIFIER ADJUSTMENT

1. RECORDING BIAS FREQUENCY ADJUSTMENT (Fig. 1)

a. Install a resistor of 10 or 50 Ohms in series with the Bias Head and connect the Vertical Input Terminal of the Oscilloscope to points (a) and (b).
b. Feed in a sine wave signal from and Audio Frequency Oscillator to the Horizontal Input of the Oscilloscope and tune the Dial of the Audio Frequency Oscillator until the Oscilloscope displays a circular or linear pattern.
c. A reading of 63 KHz ± 5KHz, indicates that the Recording Bias Frequency is correct.
d. If incorrect, it can be adjusted by inserting another condenser (C216) value 5500PF.

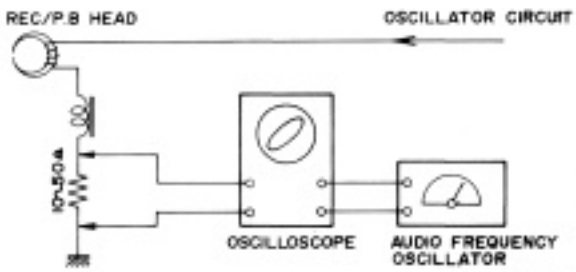


Fig. 1

2. RECORDING BIAS VOLTAGE (Fig. 2)

a. Connect the V.T.V.M. to points (A) and (B), then read the value on the V.T.V.M.
b. A reading of AC 35 V ± 2 V, indicates that the Recording Bias Voltage is correct.

3. ERASING BIAS VOLTAGE (Fig. 2)

a. Connect the V.T.V.M. to points (A) and (B), then read the value on the V.T.V.M.
b. A reading of AC 22 to 30 V, indicates that the Erasing Bias Voltage is correct.

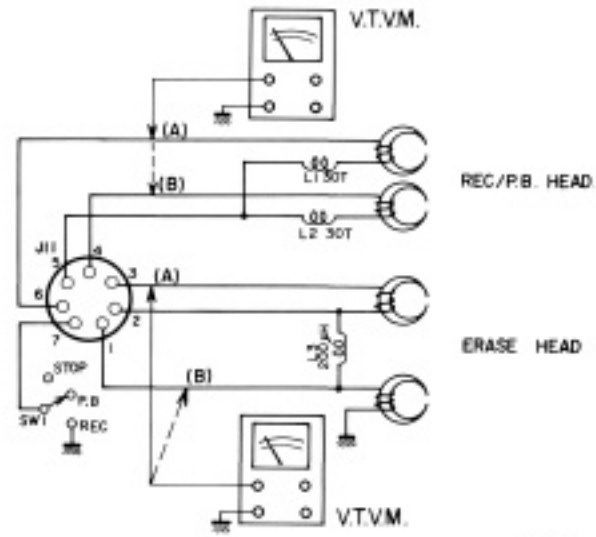
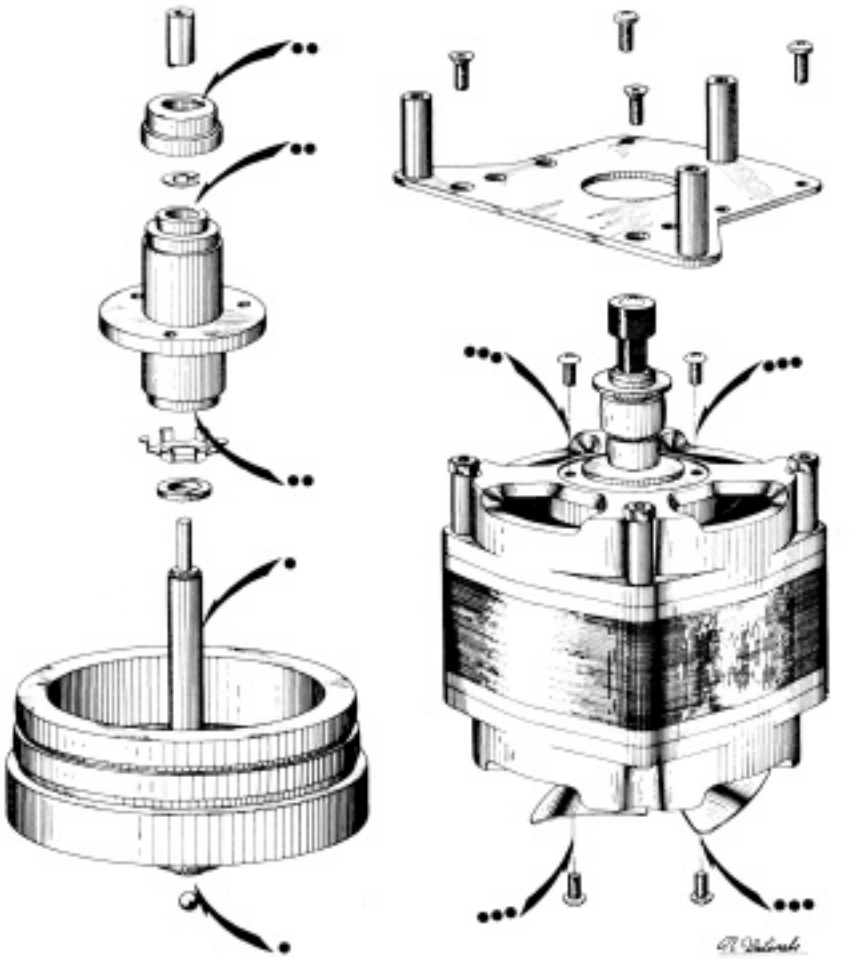


Fig. 2

VIII. MAINTENANCE PROCEDURES



FLYWHEEL ● 1 drop MOTOR

1. LUBRICATION INSTRUCTIONS

For maximum service life and optimum performance, lubricate the following parts after each 500 hours of operation. Use only light machine oil of good quality.

Motor	
Flywheel Assembly	
Rewind Idler Wheel and Wind Take-Up Idler	1 drop
Intermediate Idler	1 drop
Pinch Wheel	1 drop

Also apply a liberal film of light machine grease to each roller surface of all levers and cams.

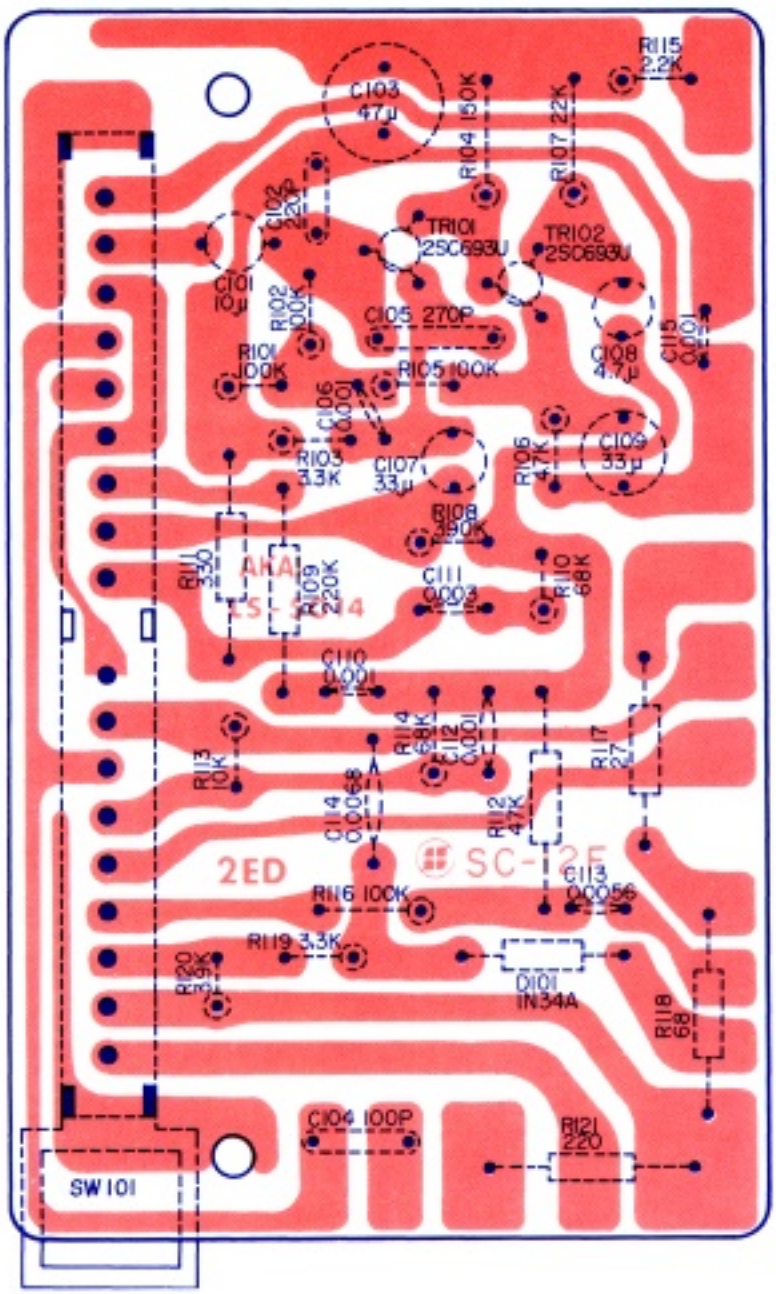
CAUTION : DO NOT OVER-LUBRICATE. WIPE OFF EXCESS OIL WITH A COTTON SWAB SOAKED IN ALCOHOL. OTHERWISE EXCESS LUBRICANT MAY BE SCATTERED DURING OPERATION AND THE RUBBER COMPONENTS WILL DETERIORATE.

2. CLEANING TAPE HEADS AND OTHER PARTS

Wipe surface of tape heads, guide roller bearing, capstan bushing and pinch wheel periodically with a soft cloth soaked in alcohol.

IX. COMPOSITE VIEWS OF COMPONENTS

PRE-AMPLIFIER P.C. BOARD (LS-5014)



MAIN AMPLIFIER P.C. BOARD (LS-5015)